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The ELECTRICAL REVIEW

FOUNDED 1872

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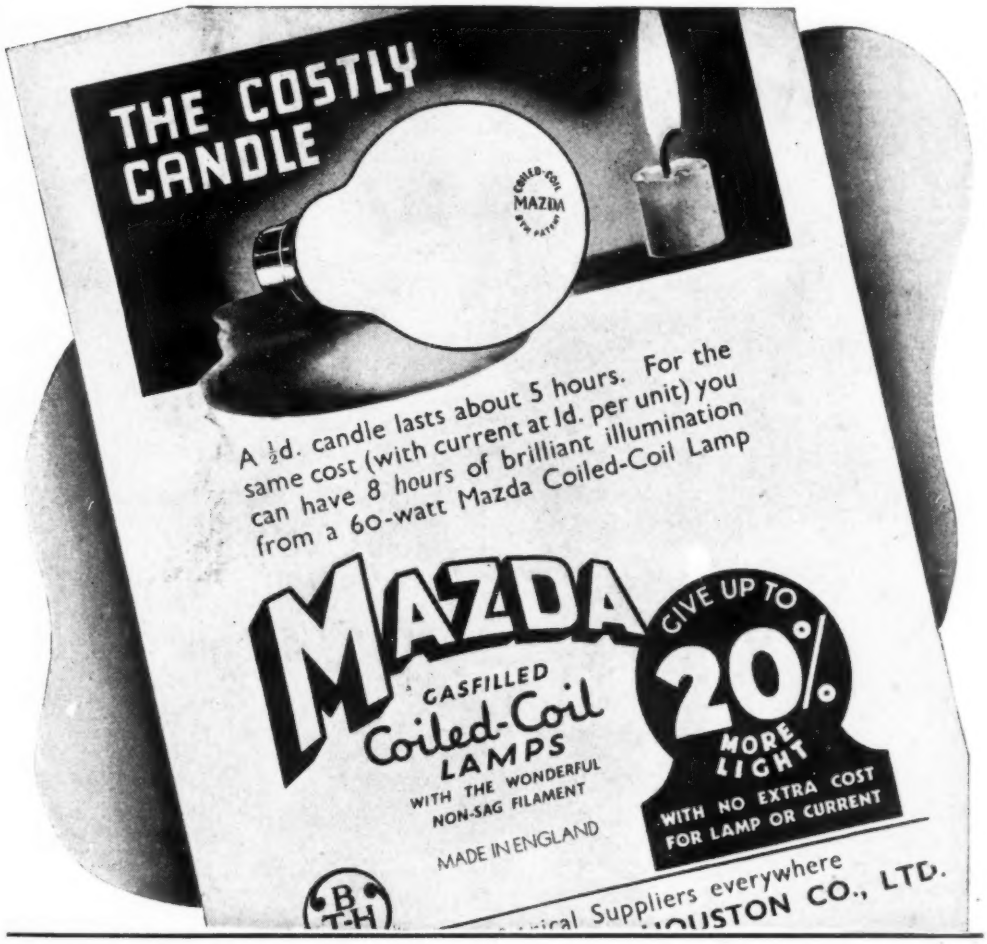
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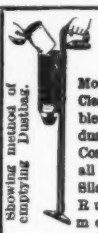

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The
Electrical Review

VOL. CXVII. DECEMBER 20, 1935. No. 3030.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

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Electricity and Coal

THE question of how far the electricity supply industry should be expected to aid the collieries in their economic plight is one that is being actively discussed just now. Some contributors to our Correspondence columns have maintained that a wages clause in fuel contracts should meet all needs. Others take the remarkably altruistic view of Mr. J. M. Kennedy that the undertakings should not object to paying considerably more for their coal.

Another viewpoint is that represented in the address given by Mr. W. B. Woodhouse to the coal trade at Leeds recently, when he pointed out that the water-power resources of some countries enabled processes to be carried out there that were formerly impracticable on account of cost. Coal can, as he says, generally compete with water-power, but if its price is increased unduly industry may go elsewhere.

During the last twenty years the tonnage consumed by every industrial group, save one, has been reduced, chiefly owing to economies in production. The exception is provided by the electricity undertakings, which now take over two and a quarter times the quantity of fuel needed in 1913, although the consumption per kWh has been halved.

The fuel requirements of the manufacturing and domestic group, which constitutes the main field for the public supply of electricity, have decreased by almost the same amount as those for electricity have advanced. Even if the falling-off were due merely to a transfer to electricity instead of to better efficiency in the use of power (as so much of it obviously is) the substitution would not have affected the mines adversely.

Four shillings a ton has been mentioned as a possible increase. This would more than neutralise the savings made during the past four years owing to technical improvements, and would add about twenty per cent. to the running charge under the grid tariff. While this need not immediately influence the higher-priced supplies, it would result in large power users automatically paying more for their energy. The most far-reaching results, however, would be in the risk of restricting the vast potential field for electrification that depends on the offer of low rates; without such, a large proportion could not be developed at all, or would fall to imported oil. Surely the fullest contribution supply undertakings can make to a solution of our coal difficulties is by extending the use of coal in the exploitation of all applications of electricity, new as well as old, that low production costs alone make feasible.

There are other aspects, also, to be taken into account. Is the supply of electricity to be saddled with an expense that will not be shared by other public services? Is the industry, which for so many years has striven after efficiency, to be penalised for its success? Is it to be handicapped, as it is in local rating, by discrimination in favour of the private production of power (which need not be electrical, and which includes the burning of coal on locomotives), or in favour of non-statutory power-stations that dispose of surplus electricity to other users? Again, has the coal industry itself done all it can (*e.g.*, by mechanisation, which very largely means electrification) to increase the earning power of its workers?

These are among the questions which ought to be answered to the satisfaction of our own industry before it accepts with equanimity proposals that at present appear to be dictated more by political than by ordinary commercial or technical considerations.

Thousands of New Canvassers

ONE might reasonably have imagined that everybody interested in pushing the sale of electricity would know why every ounce of effort should be put into the million more consumers campaign which was started by E.D.A. several months ago. The arguments have been stated here so many times during recent years, when we have urged all undertakings to proceed energetically with systematic campaigns in their own particular areas of supply, that the advantages accruing to the whole industry—sup-

ply, manufacturing, trading and contracting—as well as to the nation generally, ought to be perfectly familiar. When we pounded away at the matter a year or two ago there were some who wondered: Why all this excitement and hurry? The present campaign is designed to bring about what we then called for, so we gladly wish success to the official efforts that have been made lately to get right home with reasons why the 1935-36 campaign should be supported. We are informed that Area Conferences at Edinburgh, Newcastle, Manchester, Leeds, Birmingham and Bristol have been addressed by Mr. V. W. Dale, the go-ahead Business Manager of E.D.A. The excellent rate of advance in electricity consumption during the past ten years is, of course, attributable in part—large part, perhaps—to the business-getting schemes and propaganda of the period, and it is felt that a big campaign in the first half of next year will produce "a further kick in the curve," and so secure the million more in the allotted time. It is estimated that 4½ million houses on the mains are not connected, and for this reason, as well as because gas competition has to be met by a better education of the public, the selling organisation of electricity undertakings should be more rapidly developed. It is thought that 2,000 additional electrical canvassers or representatives will be needed if the desired million new consumers are to be secured, bringing many million pounds' worth of new production business to the manufacturers. Electricity supply authorities and others have been informed by Mr. Dale that there need be no added burden to an undertaking, because every new canvasser will pay for himself by the business that he produces. Large expenditure upon Press advertising and publicity will be used in co-operation with these canvassing efforts. A point of importance is that E.D.A. will provide means for obtaining and training canvassers, and arrangements are now in hand for schools for such training to commence operations on January 20th next.

Remember Eiba!

WE commend the "Christmas Letter" from Mr. Seabrook on page 857 to the generous attention of our readers. When, under the softening influence of the season of goodwill and festivity, they are writing out cheques for those selected relatives, friends and charities which appeal to their sympathies, let them remember also the needs of some who, once engaged in the same industry as themselves, are today hard pressed, feeling the keenness of the winter wind, and are practically down and out, waiting the hand of "Eiba" to lift them up and help them on to better times. A special contribution now to 36, Kingsway, will bring you the assurance of a Merry Christmas and Happy New Year. That is what we most heartily wish all readers of the ELECTRICAL REVIEW.

Synthetic Rubber

WHEN three months ago it was officially announced that a factory for the production of synthetic rubber was to be built in Germany, the query was raised in our "Correspondence" section as to whether the process could be carried out at a price to compete with that of raw rubber at 5d. per lb. The point is, rather, whether the qualities of the synthetic article are such as to justify the payment of a higher price. The result of research work in the United States appears to indicate that rubber can be produced chemically which is resistant to oils, acids and alkalis, and which withstands heat better and is less inflammable than natural rubber. If this proves to be so, one can think of a number of applications in which price would not be the chief criterion.

Thermal-Electric Stations

THE view that an important trend in power production in the United States is towards the development of joint plants to serve groups of factories is expressed by Mr. A. L. Nelson in the *Electrical World*. In these steam would be produced for processes and heating, hot water for manufacturing purposes, and electricity for motive power. While low operating costs may be expected for such plants, it is not clear why the capital expenditure per kW should be given at less than half of that incurred on the power companies' stations. The tendency observed by Mr. Nelson is a new one in America, where the numerous stations supplying heat do not usually supply electricity also. The combination is, however, fairly common in Russia, and on July 26th we commented on the proposal for erecting a thermal-electric station at Worksop. The technical scheme presents few difficulties—less than those involved in providing for the consumption of large quantities of high-grade and cheap low-grade heat. If the load curve for the latter coincides reasonably nearly with that for electricity, considerable economies are to be expected, but the deciding factors differ in almost every case, though steam and not electricity is always the first consideration.

Over the Border

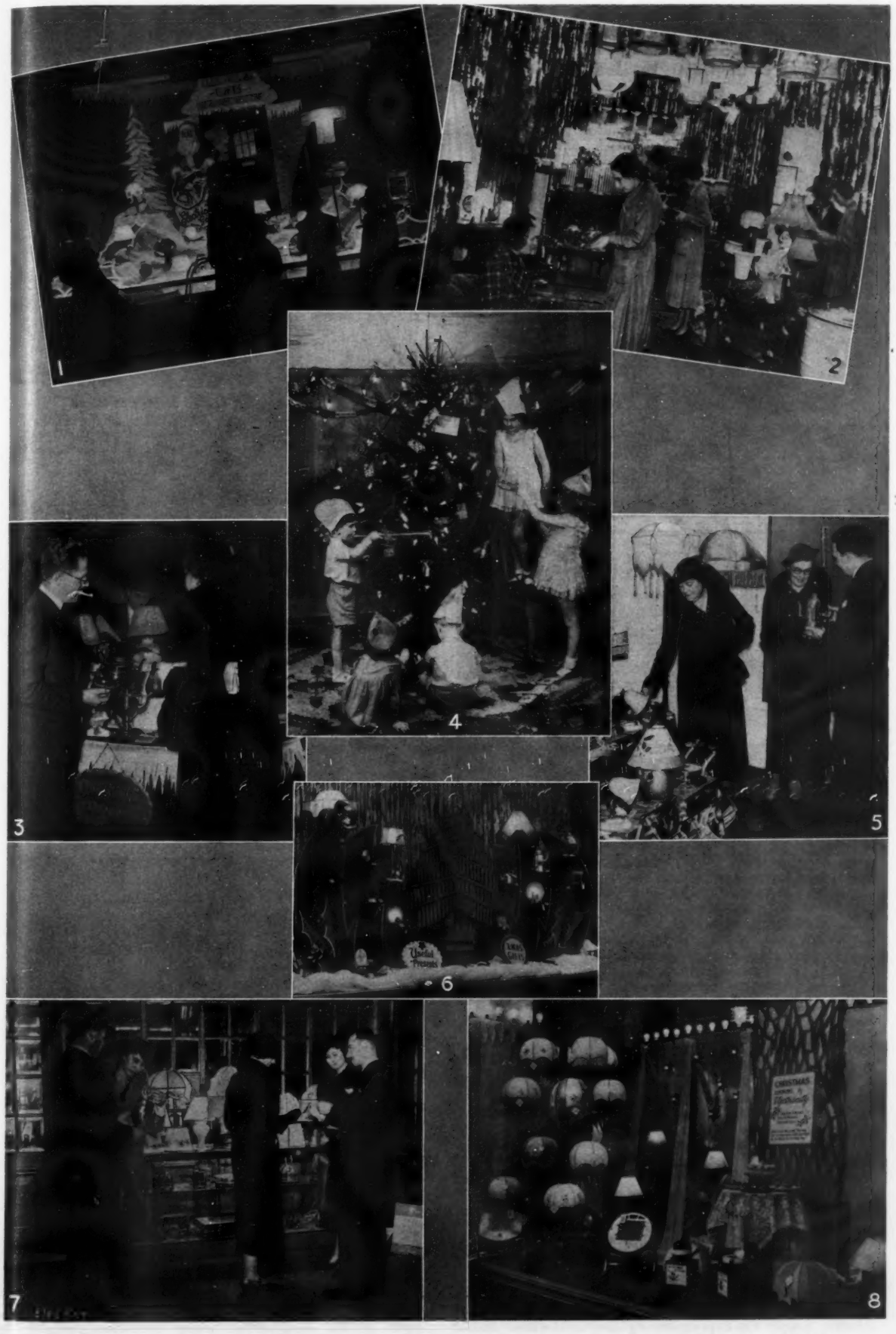
A CASE of interest to electricity supply undertakings is reported on page 861 of this issue. It relates to an action brought against the Gravesend Corporation at the instance of the Kent Electric Power Co. The Corporation received the Electricity Commissioners' consent some time ago to supply energy to two concerns just over its boundary, in the area of the Kent Electric Power Co. That consent was later withdrawn, whereupon the Corporation employed the expedient of fixing the meter registering the supply upon a pole within its area and requested the company concerned to purchase the line from that point to its works, so that it ceased to be the Corporation's property. The Corporation maintained that the consumers' terminals were at the pole, but Mr. Justice Bennett overruled this and gave judgment against the defendants.

Standard Plugs

IT seems to be generally agreed that plugs and socket-outlets should be interchangeable, not only for lowering production costs but also for the convenience of the public, and B.S.S. 546 defines the dimensions and characteristics that have been approved by the Electrical Industry Committee of the British Standards Institution. The position is complicated, however, by the existence of non-standard designs that some regard as at least as good as many of those that conform to the conditions. There was some criticism of the tenth edition of the I.E.E. Wiring Regulations on the ground that provisions primarily intended to secure safety from shock and fire were used to advance the secondary advantage of standardisation. On a later page the British Standards Institution discusses the difficulty of ensuring safety when an attempt is made to use on standard installations non-standard plugs, which may be entirely suitable when connected to their appropriate socket-outlets.

Locomotives and Tractors

AN abridged version of the paper on "Railway Electrification" for which Mr. A. M. Wright was awarded the Coopers Hill War Memorial prize and medal is contained in the current I.E.E. *Journal*. From analysis of steam locomotive and electric tractor performances, the author deduces a formula giving the permissible expenditure on electrification in pence per ton mile of running track as a function of the equivalent gradient. This indicates that conversion would pay if the whole work cost from £5,000 to £8,000 per mile of running track with a traffic density of three million trailing ton miles per track motor per annum. The statement that the saving is a constant, irrespective of the method of operation, assumes the same train weights in each case, but often conversion carries with it modifications still further favourable to electricity. Thus an increase in the length of freight trains would increase the gross return on electrification.



Christmas Activities In and Around London. **(See next page)**

1. A family group at the Hackney showrooms. 2. The Northmet Palmers Green premises. 3. Mr. C. V. Roberts, the Hammersmith showroom manager, selling a kettle. 4. An appreciative party inspects a Christmas tree with "Osram" illuminations. 5. A corner of the Beckenham showrooms, featuring Mr. B. W. Davies, the manager. 6. A Blackheath showwindow (South Met. Co.). 7. Mr. C. Kingdom demonstrates a toaster at the B. & K. showroom. 8. Lighting and cooking are the main features of this Fulham window.

Electrical Gifts for Christmas

Attractive displays by London supply authorities

THOUGH he has not yet forsaken his reindeer for an electric vehicle, Father Christmas is undoubtedly becoming more electrically minded, and, judging from visits paid to several showrooms of electricity supply authorities in and around London during the past few days, it seems quite certain that besides the more customary presents of irons, kettles, fires, &c., many of the larger appliances such as cookers and washing machines will find their way this year into our stockings, that is, of course, if we hang up extra large ones!

On this page and also on page 845 are reproduced a few of the attractive displays which we have encountered. Many novel and ingenious devices have been used to lure prospective purchasers inside the showrooms, one of the most effective being at Beckenham, where the whole of one side of the ground floor from the window itself to the back of the showrooms, a distance of over 50 ft., has been transformed into a forest scene. In the other Beckenham window Mr. B. W. Davies, the manager, has arranged a large assortment of electrical equipment suitably decorated with holly and other indications of the festive season.

A large demand for small table lamps is reported by Mr. K. W. London, the manager of the Hackney Electricity Department's showrooms, where one of the main windows contains an effective snow scene depicting Father Christmas handing out presents from his sack with a placard stating that

Above: A prize-winning window at Romford. Right: An elaborate scheme at West Ham

"Electrical gifts are always welcome." Inside is a series of tableaux in enclosed glass cases demonstrating the merits of electrical apparatus as presents.

An electric cooker surmounted by a picture of Santa Claus, and the words "Give her an electric cooker," forms the centrepiece of a simple yet appealing display at the Ilford electricity showrooms, various types of electric fires and a card telling passers-by that they are "presents for the present and for all time" completing the scheme.

The R.S.P.C.A. should have something to say regarding the load of gifts which the two model reindeer have to haul in windows of the West Ham showrooms (manager: Mr. T. H. V. Moore). Half-open snow-covered gates indicate the "Road to progress," and the snow-clad firs introduce the authentic Christmas atmosphere.

A Prize-winning Window

First prize in a local shopping week competition has been awarded for a window tableaux at the County of London Electric Supply Co.'s premises at Romford where special illuminations and decorations have been arranged. It shows a woman engaged in packing up her electrical gifts. Mr. S. Glover, the showroom manager, says that bowl fires are proving particularly popular. Good business is being done with irons and coffee percolators at the Hammersmith electricity showrooms, and Mr. C. V. Roberts, the manager, says that the change-over of a section of their area from 110 to 230 V has greatly increased the sales of electric fires.

A cooker display at Ilford

As pictures in our last week's issue showed, the centre of the window display at the Fulham electricity showrooms has been designed to draw attention to cooking demonstrations going on inside, a loud speaker over the entrance being connected to a microphone in the model kitchen. Mr. S. J. England, the manager, says that the arrangement is proving very successful.

A change of display each week has been having very beneficial results at the Brompton and Kensington Electricity Supply Co.'s premises at Earl's Court (showroom manager: Mr. C. Kingdon), while a simply arranged display of a few selected articles enabling prospective customers to make quick decisions is the scheme adopted at the South Metropolitan E.L. & P. Co.'s Blackheath premises (manager: Mr. R. J. Mart).

In the Northmet Area

Large sales are said to have resulted from a window display called "Santa's Electrical Department" at the North Metropolitan Electric Power Supply Co.'s Palmers Green showrooms (supervisor: Mr. A. C. R. Wickens). Here a representative selection of some of the smaller electrical appliances is attractively set out on appropriately decorated shelves, Santa Claus being shown setting forth on his annual journey with a sackful of presents on his back: goblins around him are busily engaged in packing up the gifts, electric signs displaying the words "Gifts that please" and "Santa suggests." Adjoining windows contain further gaily lighted suggestions for gifts, the words "A Merry Xmas to all" in coloured lamps running across the front of the building.

It must be emphasised that those displays mentioned are merely examples of what is being done. There is no doubt that each year electricity supply authorities and electrical traders in London and the provinces are making more and more of the opportunities which Christmas presents for "putting across" the electrical message to the public.

In the local newspapers throughout its area the North Metropolitan Company is running a series of advertisements inculcating the electrical Christmas gift idea. One of these is a useful guide presenting fifteen typical appliances pictorially, the price being given in each case.

Frequency and Voltage Change.

By R. H. Rawll, A.M.I.E.E.

The progress made in Birmingham

THE physical prominence of the national grid has given many people the impression that all the engineering work necessitated by the requirements of the Electricity (Supply) Act, 1926, has been finished. A matter of equal importance to the construction of the grid is the complicated work involved in the standardisation of frequency. Until this has been completed full benefits of the pooling of the generating plant of the selected stations and the unification of control under this Act cannot be realised. In the areas of some of the larger supply undertakings which originally generated at frequencies other than the standard 50 cycles per second, this work is not yet finished, chiefly on account of the enormous amount of consumers' industrial plant to be altered or replaced.

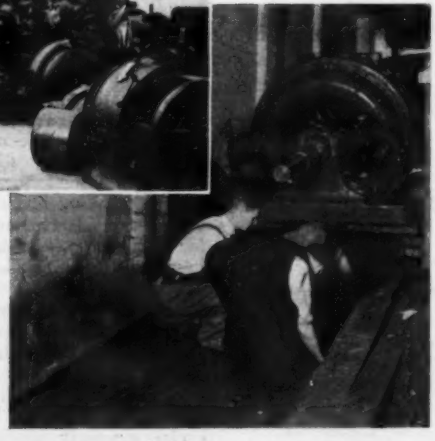
An outstanding example of the engineering problems that have to be faced is provided by the City of Birmingham Electric Supply Department. The high-voltage distribution system of the undertaking consisted of an extensive 5-kV, 25-cycle, three-phase network to which numerous large industrial consumers were connected, and which also supplied many sub-stations where rotary convertor and rectifier plant fed into the 440/220-V, three-wire d.c. network. There was also a comparatively small 6-kV, 50-cycle, three-phase network originally owned by the Aston Manor Corporation (which had been absorbed by the Birmingham Corporation), the supply to which was given by means of frequency changers from the 5-kV, 25-cycle system.

Early Work

Birmingham has been carrying out change-over work of one kind or another for a number of years. For instance, low-voltage d.c. three-wire distribution in the Aston district was at 460/230 V and in the Handsworth district (also absorbed under the Greater Birmingham Scheme) at 480/240 V. In order to standardise the voltage throughout the Birmingham area the voltages in these districts were lowered in 1924 to the 440/220 V declared in the main d.c. three-wire supply area.

With the introduction of supplies to the rural areas in 1926 it was decided to employ the standard 400/230 V, 50-cycle, three-phase, four-wire system. Supply, obtained from frequency changers in the city area connected to the 5-kV 25-cycle system, was transmitted to the step-down transformer sub-stations at 11 kV, 50 cycles, three phase.

The provision of this 11-kV, 50-cycle supply presented an an opportunity to begin changing over the d.c. low-voltage networks of the outlying residential areas of the city to 230 V, 50 cycles (existing three-core distributors being fed, where possible, with two phases and neutral from a 400/230-V, three-phase, four-wire distributing point). This work was started in 1928.



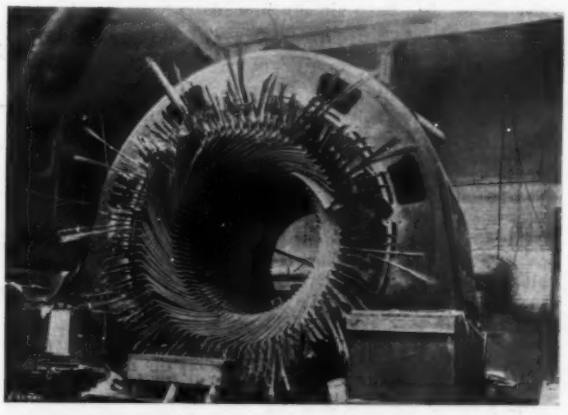
Displaced 25-cycle motors awaiting scrapping, and (right) unloading a large mill motor (Crompton Parkinson, Ltd.) under difficulties

In the same year, in accordance with the Central England Scheme under the 1926 Act, Birmingham was called upon to alter its 25-cycle system for operation at the standard 50 cycles. The 25-cycle generating plant was located in the following four stations :—

Station	kW installed (m.c.r.)	Generator voltage (kV)
Hams Hall	60,000	11
Nechells Princes	131,250	5
Nechells Temporary	22,000	5
Summer Lane	46,000	5

The Department decided to take the opportunity presented by the general upheaval due to the frequency change-over to alter concurrently the high-voltage system from 5 kV to 11 kV, in order to improve the efficiency of distribution. The liability of the Central Electricity Board being strictly limited to the expenditure involved in altering the frequency, all costs due to the raising of voltage are met by the Department.

Hams Hall and Nechells Princes are selected stations under the Central England Scheme and form connections, *via* the Central Electricity Board's sub-stations, to the 132-kV grid. In addition to these two grid connections, which are on the north-east side of the city, a further grid connection was provided by the Board on the south-west side at Bartley Green, which is a transformer sub-station only. In each of the three grid sub-stations two 45,000-kVA, 132/11-kV transformers were installed by the Board.



An 18,750-kW alternator stator being rewound for 11 kV, 50 cycles, at the Nechells Princes station

TABLE I.—PRINCIPAL ITEMS OF PLANT AFFECTED BY FREQUENCY CHANGE

	No.	Capacity.
Generation :—		
Alternators	18	259,250 kW (m.c.r.)
Distribution :—		
Rotary convertors (including transformers)	—	111,300 kW
Rectifiers (including transformers)	—	15,320 kW
Trunk and static transformers	—	332,525 kVA
Consumers :—		
Machines...	23,000	318,064 h.p.
Transformers	—	200,000 kVA
H.v. consumers	535	—
L.v.-network consumers	3,861	—

Since, at the time appointed for starting the frequency change, a supply of 50-cycle current was not available *via* the grid from selected stations of other undertakings in the Central England Area, it was necessary to install a 30,000-kW set at Hams Hall and a 25,000-kW set at Nechells Princes, but without increase of boiler capacity. Hams Hall and Nechells Princes stations are connected together by a double-circuit, 132-kV grid line, and a single-circuit grid line runs from Hams Hall to Bartley Green. The 25-cycle generating plant at Hams Hall fed into the general 5-kV, 25-cycle network through 33-kV trunk cables, while that at Nechells Princes and Summer Lane fed partly direct into the 5-kV network and partly through 33-kV trunk cables. The generating plant at Nechells Temporary fed solely into the 5-kV network, with interconnector cables to the Nechells Princes 5-kV bars. These 33-kV, 25-cycle trunk cables fed main step-down supply sub-stations in various parts of the city, and in order to obtain a nucleus 50-cycle supply at these points to commence the change-over, additional 33-kV trunk cables had to be laid, together with their associated 33-kV and 11-kV switchgear and step-up and step-down transformers.

A considerable number of outgoing 11-kV cables from such main supply sub-stations had also to be laid for connecting into the existing 5-kV network to begin the change-over of the first sections of the high-voltage system.

The whole of this preparatory work, which consisted of supplying and installing the 30,000-kW and 25,000-kW turbo-alternators, seventeen trunk transformers totalling 100,000 kVA, eighteen miles of 33-kV trunk cables, twenty-six miles of 11-kV ring mains and feeder cables, and numerous 33-kV and 11-kV switches, together with the necessary extensions to

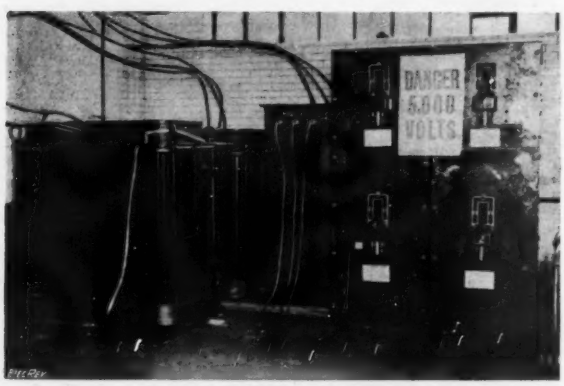
several main sub-station buildings, was completed in eighteen months from the time the various contracts and orders were placed. This enabled the change-over proper of both the frequency and the high voltage to be commenced at the August holiday period in 1931.

In addition to the items of plant affected by frequency change given in Table I, the vast majority of the h.v. switchgear, whether belonging to the Department or to consumers, being originally installed for use on 5 kV, has had to be modified or replaced for use on 11 kV. The detailed methods adopted of changing over the h.v. ring mains, consumers' plant, sub-stations, &c., have already been described by myself in the ELECTRICAL REVIEW of February 26th, 1932.

Rewinding the Plant

A complete programme had to be made out for the rewinding of the generating plant. The amount of plant to be taken out of commission for this purpose in any year is reviewed at the beginning of that year in relation to the maximum loads anticipated on both the 25- and 50-cycle systems at the next December peak. Since the rewinding of a large alternator takes approximately six months the work can, for loading reasons, be carried on only during the summer months. The rewinding of the stators is done on site at the generating stations, but work in connection with the rotors is effected at the manufacturers' works.

Fig. 1 shows the growth of the 50-cycle load, diminution of



Temporary e.h.v. and transforming equipment at a consumer's premises during the change-over period (By courtesy of the *Birmingham Gazette*)

the 25-cycle load and growth of the combined total load, together with the installed generator capacities available to deal with these loads, from the commencement of the change-over at the beginning of August, 1931, until September 30th, 1935. It should be borne in mind that the generator capacity

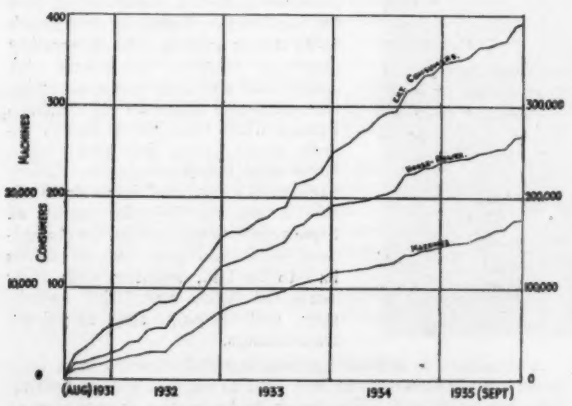


Fig. 2.—Rate of change-over of consumers' plant

is by no means the same thing as the effective output capacity. The curves show that the rewinding of the generating plant at Hams Hall station was completed in 1933, from which time the output of this station has been solely 50-cycle current. The rewinding programme at Nechells Princes station has been very nearly completed, and this station will cease to generate 25-cycle current in the near future.

The generating plant at Summer Lane and Nechells Tem-

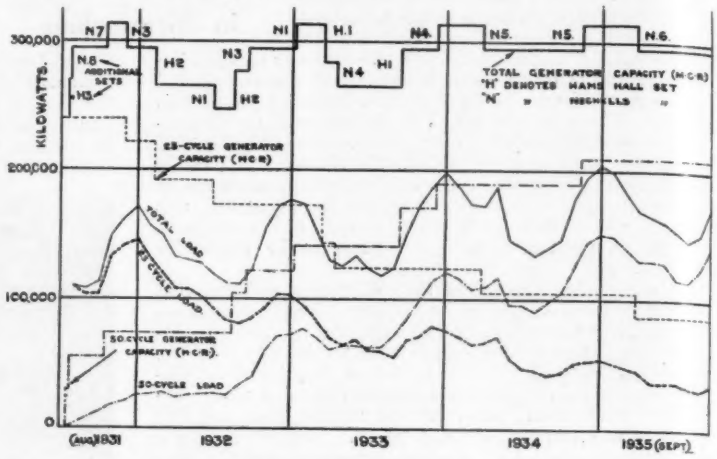


Fig. 1.—Growth of 50-cycle load and diminution of 25-cycle load, showing rewinding of generators and capacities available

porary stations will not be rewound for 50 cycles, but will remain in operation on 25 cycles until the completion of the frequency change, and their loads as changed over will be taken up by one of the new 50,000-kW, 11-kV, 50-cycle sets now under construction for Hams Hall station. The trunk transformers are released for rewinding during the summer months as and when the progress of the frequency change reduces the load sufficiently on the several 33-kV trunks to allow of their being taken out of commission.

Concurrently with the frequency change from 25 to 50 cycles, the change-over of the majority of the low-voltage networks in the outer areas of the city from 440/220 V, d.c., to 400/230 V, 50 cycles, has been carried out at the cost of the Department (the C.E.B. being liable for the costs of frequency change only). This policy has enabled many of the 25-cycle rotary convertor and rectifier plants to be scrapped and replaced by 50-cycle static transformers.

Nevertheless, a considerable quantity of converting plant has been reconstructed for working on 50 cycles in order to supply the heavily loaded d.c. networks in the centre of the city and the traction supplies to the Corporation trams and trolley-buses. The opportunity has also been taken in several cases to replace 25-cycle rotary convertors by 11-kV, 50-cycle motor convertors, and to replace in a given sub-station a large number of small 25-cycle rotary convertors by fewer 50-cycle units of greater individual capacity.

The Greatest Task

The change-over of consumers' 25-cycle plant connected to the h.v. system, which is the greatest task of all, has proceeded continuously since August, 1931. It has been necessary, in order to prevent dislocation of production, to carry out the work mainly during the week-ends and public holidays. Fig. 2 shows the steady rate of progress that has been maintained.

The number of motors installed at many of the individual works affected runs into three and sometimes four figures.

The largest change-over effected so far in any one week consisted of replacing 628 machines totalling 16,190 h.p. and sixty-eight transformers totalling 11,239 kVA, together with their controlling h.v. switches and cables, at the premises of twenty-eight consumers. I believe this constitutes a record for all supply undertakings throughout the country who have been, or who are still, engaged on frequency standardisation under the 1926 Act.

Every opportunity and encouragement is given to consumers to modernise their drives and reorganise the electrical lay-out of their plant while the change-over is in progress, the extra costs involved thereby above a like-for-like replacement being the consumers' liability. Since the 5-kV, 25-cycle transformers of consumers have had to be rewound for 11 kV, 50 cycles, wherever possible consumers have been advised to standardise a secondary voltage of 400 for power purposes; any costs due to this alteration in voltage, as distinct from frequency, are the consumer's liability. Where the Department provided the 25-cycle transformer for a consumer with a secondary voltage for power other than 400 V, the Department has borne the costs involved of standardising this pressure at the time of the change-over.

The lighting voltage of many works is 110 and most consumers retain this on 50 cycles in preference to the standard 230 V on account of the decided advantage of the lower vol-

Accessories. By H. R. Taunton, A.M.I.E.E.

Their construction and installation

SECTION V of the I.E.E. Wiring Rules, dealing with temporary installations, is short and necessarily indefinite; so that the contractor will have little guidance from it if he refers to it. Not that he is likely to; with a temporary wiring job in hand he will, as heretofore, use his common sense and second-hand stock. And builders will continue to festoon their work in progress with tattered cable and battered accessories, and yet, somehow, avoid fire or fatality.

Talking of builders' temporary wiring, an interesting example may be seen in the British Museum; not as an archæological exhibit, but in connection with the alterations to the north block, near the Egyptian galleries. It is, in fact, neatly carried out in cleat work, and though it has been installed for much more than the " three months " of Rule 501, it no doubt complies otherwise with the spirit of that rule. With all its merits, however, it yet suggests the first chapter of a " thriller," for much of it is within reach of any crook or maniac—or mummy, perhaps!—armed with a pair of pliers. It is to be hoped—indeed, it may be assumed—that no essential lights in the public galleries are connected to the system.

Coming to Section VI, Rule 602, occupying a whole page, is a good example of the, surely needless, repetition which characterises so many of the rules. Clause A merely refers to other rules, Clause B is the same as Rule 1323G, and Clause D as (part of) Rule 405H. Clause E is covered, half by Table 15, col. 7, and half by Rule 1323D. Only Clause C is not to be found elsewhere, and that is so largely obvious as hardly to be worth the space it occupies. Only the ingenuity of Mr. Heath Robinson could suggest any other means of earthing a portable metal fitting than the earth-continuity conductor of its flex. The long note to this clause is covered partly by the amendment to Rule 1323D and partly by Rule 1001C, E.

Rule 604A, the same as 93B in the Ninth Edition, deserves more attention than it seems to get. It allows porcelain connectors to be enclosed either in a fitting or in its wood surface block. On a majority of l.c. to c.t.s. wiring jobs, however, or of cheap conduit jobs without proper ceiling boxes, where the baseplate of the fitting or the recess in its block may not accommodate the connectors, they will be found tucked back in a hole in the ceiling—a bad breach of a good rule.

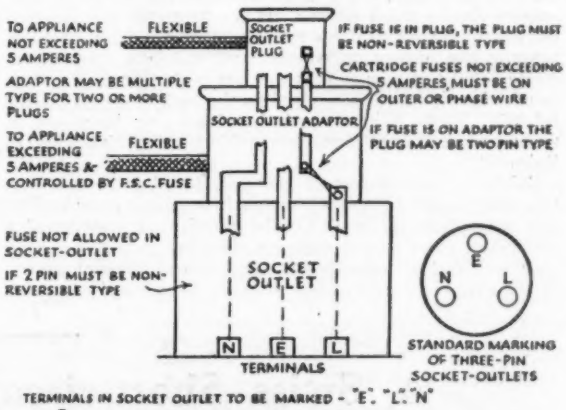
Adaptors and Switch-lampholders

Another good rule, more honoured in the breach than in the observance, is 606. An adaptor—" lampholder-plug "—is an easy convenience too often abused. It will, for instance, be easier to believe in the universal authority of the Wiring Rules when manufacturers cease from listing special adaptors for electric irons. They have had plenty of time to assimilate the rule, which was No. 111 in the Ninth Edition.

Does a switch-lampholder comply with the requirement of " a switch fixed in an adjacent, readily accessible position " (as Clause A) when its controlling switch is not? In Clause C of Rule 607, dealing with " receptacles " for flush sockets, " oak (English), teak, or mahogany " are given as the only woods allowable. It would have been simpler to have said " hardwood "—here and in Rule 609B—for there can be no reasonable objection to the use of such woods as, say, beech or walnut. These, by the way, are allowed in a much wider list of hardwoods given in another Rule, 617B.

It is difficult to grasp the intention of Clause D. How can a socket be controlled—individually—by a switch which is *not* " in the final sub-circuit to which it is connected "? The most that can be made of the wording is a needless reminder of Rule 201. Clause F, in which the same curious stipulation occurs, is equally needless, for the special case is already amply covered by Rule 207.

Clauses G to K are all new and important. They, and Rule 608, are well illustrated by a diagram given on page 55 of the " Employees' Guide," here reproduced by the courtesy of the Association of Supervising Electrical Engineers. Clause L of Rule 607 has been deleted by a recent amendment, which has already been criticised in these pages. It certainly seems a retrograde step. The effect of the deletion is that a small appliance, such as a desk fan, can now be fitted with a 15-A plug and connected directly to a 15-A socket without


TO APPLIANCE NOT EXCEEDING 5 AMPERES
FLEXIBLE
SOCKET OUTLET PLUG
IF FUSE IS IN PLUG, THE PLUG MUST BE NON-REVERSIBLE TYPE
CARTRIDGE FUSES NOT EXCEEDING 5 AMPERES, MUST BE ON OUTER OR PHASE WIRE
ADAPTOR MAY BE MULTIPLE TYPE FOR TWO OR MORE PLUGS
SOCKET OUTLET ADAPTOR
IF FUSE IS ON ADAPTOR THE PLUG MAY BE TWO PIN TYPE
TO APPLIANCE EXCEEDING 5 AMPERES & CONTROLLED BY F.S.C. FUSE
FLEXIBLE
FUSE NOT ALLOWED IN SOCKET-OUTLET
IF 2 PIN MUST BE NON-REVERSIBLE TYPE
SOCKET OUTLET
N E L
TERMINALS
E N L
STANDARD MARKING OF THREE-PIN SOCKET-OUTLETS
TERMINALS IN SOCKET OUTLET TO BE MARKED - "E", "L", "N"
E = EARTH L = LIVE N = NEUTRAL
NOTE. WHEN APPLIANCES REQUIRE EARTHING, SOCKET-OUTLET, ADAPTOR AND PLUG MUST BE 3 PIN TYPE OR APPLIANCE MUST BE INDEPENDENTLY EARTHED

A.S.E.E. diagram explaining the meaning of " socket-outlet," " socket-outlet adaptor " and " socket-outlet plug "

the use of the plug-adaptor previously required. The appliance, therefore, is not protected by the cut-out called for in Rule 608C, and the intention of that rule is largely stultified.

Switch Casings

Rule 609B, with its recent amendment, replacing the old Rule 67G, calls for consideration. Briefly, it requires any switch, flush or surface to be mounted in or on a metal box if its wiring is in conduit; but if the wall on which it is fixed is fireproof its cover, with any system of wiring, may be of " oak (English), teak, or mahogany," instead of the normal metal or " non-conducting incombustible material." The wording is not very clear, but that is its obvious meaning. On the face of it, this bars the practice of butting conduit into a wood surface block; yet this is expressly allowed by Rule 408F.

The question also arises: Is the annular block used with semi-recessed switches a " case " within the meaning of the rule? If so such switches apparently cannot be used on non-

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Frequency and Voltage Change *(Continued from preceding page)*

tage as regards severity of shock. There are, however, a number of instances where the lighting supply is at 110 V on a three-phase, three-wire system, which, unless double-pole tumbler switches are employed (a very unlikely contingency) results in one pole of the lampholders being alive, even if the controlling sub-circuit switch is in the off position. In such cases the Department offers, when rewinding the lighting transformer for 11 kV, 50 cycles, to provide a secondary star winding of 190 V across phases with earthed neutral point available (giving 110 V phase to neutral) so that the consumer at very little expense can then adapt his lighting wiring to a 190/110-V, three-phase, four-wire system; this enables him to connect the existing single-pole sub-circuit switches in the phase-wires and thus prevent one pole of the lampholders being alive when the switch in question is off.

Owing to the impracticability (and decided undesirability) in most cases of replacing 5-kV, 25-cycle motors by 11-kV, 50-cycle machines, low-voltage motors with additional transformer capacity are generally provided, although in certain circumstances 5-kV, 50-cycle motors have been installed in conjunction with 11/5-kV step-down transformers.

Comparing the details of the frequency-change work carried out to the end of last September in table 2 with those given in table 1, it will be seen that about three-quarters of the total work has been completed and it is hoped that the remainder will be finished in the near future.

TABLE II.—SUMMARY OF 25-CYCLE PLANT CHANGED OVER FROM AUGUST 1ST 1931, TO SEPTEMBER 30TH, 1935.

	No.	Capacity.
Generation :—		
Alternators rewound	7	153,750 kW (m.c.r.)
Auxiliary plant	128	10,266 h.p.
Auxiliary transformers	9	8,250 kVA
Distribution :—		
Rotary convertors	66	62,700 kW
Rotary convertors scrapped due to change of d.c. network to 50-cycles	19	7,500 kW
Rectifiers	40	6,092 kW
Rectifiers scrapped due to change of d.c. network to 50-cycles	46	5,296 kW
Total converting plant changed over	—	81,590 kW
Trunk transformers	64	255,500 kVA
Static transformers feeding l.v. network	13	2,075 kVA
Consumers :—		
Machines	17,474	267,411 h.p.
Transformers	804	150,165 kVA
H.v. consumers	391	—
L.v.-network consumers	3,853	—

Acknowledgments are due to Mr. F. Forrest, city electrical engineer, Birmingham, in respect of the information given above.

fireproof walls, and on other walls their blocks must be of one of the three hardwoods named. The intention of the rule is excellent, but as it stands it is too rigid and will conflict continually with the intentions of architects and decorators. And every contractor knows quite well whose ideas will prevail in the end!

Rules 610-612 are interesting in that they envisage for the first time the use of circuit-breakers instead of fuses for the protection of small loads down to 3 A—a tendency of modern practice.

Rule 613 is an example of the unnecessary. Two lines of it refer to the construction of fuse-switches, which should have no place in a section nominally dealing with "installation" only, and which is properly dealt with in a later section; and the other two lines are nothing more than a reference to the rule immediately following. The first clause of this (Rule 614) and of several other rules in this section are equally needless and out of place.

Rule 614, dealing with cut-outs, replaces No. 68 in the Ninth Edition, and, apart from the reference to the details of their construction, is much shorter. It is noteworthy that whereas the old rule gave two pages to cut-outs intended for extra-low pressure the present rule dismisses them in a single short clause. What is new is that cut-outs protecting instruments or pilot lamps may now be fixed on the back of a switchboard (cf. 64F, Ninth Edition), and that fuses may be placed in plugs, as well as in plug-adaptors, subject to the stipulations of Rule 6071.

Rule 616 is an important one and, to all intents, a new one, for the old Rule 106C, which it amplifies considerably, was not sufficiently explicit to be effective. I have heard a contractor, on a supply engineer objecting to his mounting within six feet of each other two switches on different phases, challenging him to show any authority for what, in the end, both agreed was only an unwritten law. Evidently neither had taken the trouble to read the then current Wiring Rules.

Now that so many buildings are balanced on three-phase systems the danger of a high pressure between two adjacent points has become a common possibility. It is of lesser importance in switch-rooms, where, however cramped the space grudgingly conceded by the architect, it is easy enough to adopt effective safeguards. The real danger, against which this rule, particularly its Clause B, is framed, is in large rooms or halls. Supply authorities, in their anxiety for a balance, will often insist on such places being split, so that, if socket circuits are connected, there may easily be flexes—bound, sooner or later, to become defective—in contact with each other at differing phase voltages.

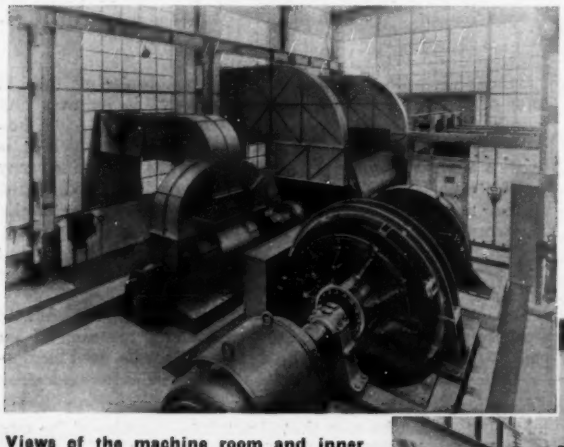
The contractor will be wise in such cases to take a firm stand against the supply authority, giving it a balance in some other way, rather than relying too much on Rule 616B. That is all very well in its way, but users *will* have portable apparatus, and they will *not* easily be persuaded to use armoured flexible—the expedient suggested. Rule 617C is new. It stipulates that flex in bathrooms shall be c.t.s.—a wise rule, if only it be observed.

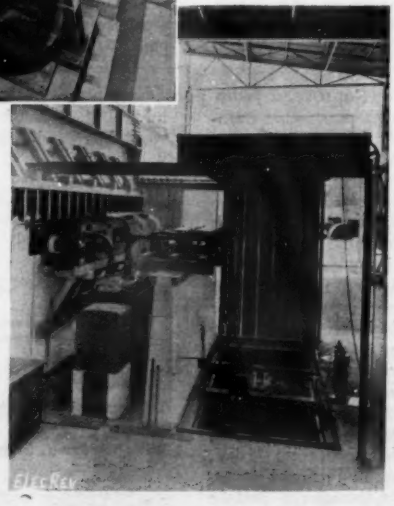
In Rule 618C the height at which fittings and accessories may be fixed in garages has been reduced to 4 ft. 6 in. from the previous 6 ft. of the Ninth Edition, No. 67J. The note to the rule will, it is to be feared, remain no more than a pious expression of opinion. In spite of its "strong recommendation," handlamps—particularly in private garages—are so much a necessity, and portable heaters so much a convenience, that users will certainly continue to risk their possible dangers. The justification of the note is that when the inevitable catastrophe happens, in a blue moon, the conscientious contractor who has quoted it to his customer will be able to say: "I told you so!"

A Swiss Short-circuit Testing Installation

Operation and safety devices

TESTING plant for determining the ability of switchgear, transformers and other equipment to withstand short-circuits, has been built by the Oerlikon Co. in Switzerland. Power for testing is furnished by a generator that can be connected star or delta, and in series or in parallel. It is linked up through choking coils, and a protective circuit-breaker, either directly or through the intermediary of a transformer.





Views of the machine room and inner test room (right) as seen from the control room

The construction of the building is such that the superintending engineer can see the whole machine room when standing in front of the switch desk, while a good view of the test room can be obtained through a slit in a strong steel plate. The oscillographs and other measuring instruments are in a room next to the control room, separated from it by a glass partition, and an observation slit is also provided to give a view of the machine room. Next to the slit is a small panel in the wall with the master switches for carrying out the short-circuit tests.

The short-circuiting generator is designed for 1,500 r.p.m., 12,000 V and 3,000 A. Its leakage reactance amounts to 0.192 ohm, so that in the case of a short circuit at 14,000 V, the output to be switched on exceeds one million kVA. As the generator is able to develop a peak of more than 300,000 A it can also be used for testing the dynamic strength of the coils of current transformers, isolating switches, &c. The generator is protected against short-circuits between phases by differential relays, and against short-circuits to earth by a special equipment. If a fault develops in the generator all driving motors are switched off; the generator is de-energised; carbonic-acid fire extinguishing equipment comes into operation; and braking can be applied by exciting the stator of the driving motor with d.c. and by loading the rotor on the starting resistances. Electrical and mechanical interlocking devices are provided on the circuit-breakers and isolating switches for preventing the h.v. a.c. system from being connected to the d.c. side through faulty switching operations.

Instead of using barring gear the set is started by means of the crane in the test room. A rope is suspended from the hook of the crane and run through a pipe laid in the floor to the coupling flange between the generator and its driving motor, on which the free end of the rope is wound.

In view of the drop in speed of the generator when the short-circuit takes place, the main exciter is driven by its own 560-kW motor. Before the short-circuit both sets are cut off from the 6,000-V system, so that the latter remains entirely undisturbed. The whole short-circuit output has therefore to be supplied by the kinetic energy of the rotating masses. The jump in excitation is caused by short-circuiting a resistance in the rotor circuit of the short-circuiting generator; as a result, the voltage at the rotor jumps up to several times its value. The shunt winding of the main exciter is, on the other hand, fed by a small separately excited auxiliary exciter set.

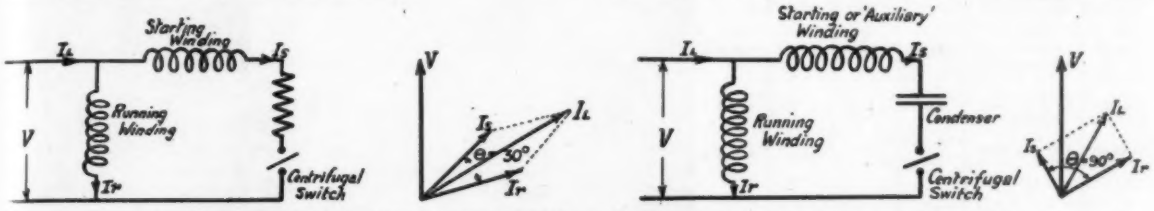
The choking coils for reducing the short-circuit currents at constant voltage are arranged for quadruple series-parallel connection; they permit of the reduction of the output interrupted in twelve steps down to 18 per cent. of the full output.

Single-phase Motors.

By R. D. Ball, A.M.I.E.E., and L. Roberts, M.I.E.E.

Recent developments for securing three-phase starting characteristics

A NOTABLE advance in recent years in single-phase motor design has been the introduction of capacitor motors, which are available not only in fractional horse-powers but also as large slip-ring machines up to 50 h.p. with starting torques and starting currents similar to those of three-phase slip-ring motors of the same powers and speeds. The capacitor motor has become a practical proposition only since the reduction in cost and the great increase in reliability of condensers (the latter having been greatly influenced by the radio industry).



Connections and starting vector diagrams of (left) a split-phase motor and (right) a capacitor motor

With fractional-horse-power capacitor motors there is always a temptation (on the ground of cheapness) to supply electrolytic condensers. Such condensers have been used in great numbers in the United States, but there the usual single-phase voltage is 110 whilst in Britain it is 230; this is one of the main reasons for the difficulty experienced in this country in obtaining a satisfactory electrolytic condenser. In the present state of the art of design of small condensers for 230-V supplies, we believe that it is better to err on the safe side and pay a little more for a paper dielectric, solid-filled condenser. Electrolytic condensers can be made for short-time ratings only, whereas for large capacitor motors the condensers are left in circuit all the time.

In the past the single-phase motor was generally looked upon as possessing poor starting and run-up torques, and as being heavy and costly; for outputs above 5 h.p. even a repulsion-induction motor did not meet all requirements in these respects. The stators of the first single-phase motors were provided with a running winding and a second winding at 90 electrical degrees to it. This second winding, known as the starting winding, is either of the high-resistance type or is in series with a high resistance externally, or else an inductance is inserted in order to provide a difference in phase between the running-winding and starting-winding currents. This type is known as the split-phase motor.

The starting torque is obtained by a combination of the rotor currents induced by the running winding and the flux created by the starting winding and vice versa. The torque is, therefore, proportional to the flux and current, that is, to the product of the running-winding current (I_r) and starting-winding current (I_s), taking into account their in-phase components.

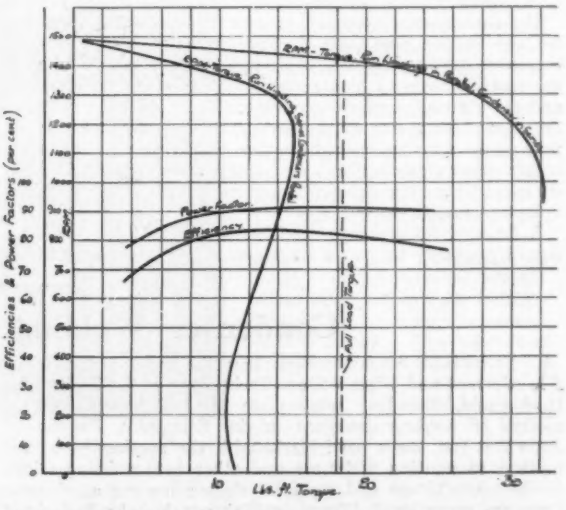
We therefore have torque $= KI_rI_s \sin\theta$, which becomes a maximum when θ equals 90°, K being a constant depending on the size of the machine, and θ the angle between the running-winding and the starting-winding currents.

Owing to design limitations, the angle θ cannot usually be arranged to exceed 30°, and the torque with this type of motor cannot, therefore, exceed half the maximum obtainable theoretically; at the same time, the resultant line current I_L is not very far short of the arithmetical sum of I_s+I_r.

In smaller split-phase motors, the extra resistance is incorporated in the starting winding itself, and a centrifugal switch cuts out the starting winding when the motor is up to speed. Squirrel-cage motors are suitable up to about ½ h.p., and considerable advances in design have resulted in good starting and accelerating torque, freedom from crawling and silence of operation. For larger squirrel-cage motors, up to about 15 h.p., a graduated-resistance starter is used which places the two windings in series (with a resistance in shunt to the starting winding), but here again the phase split is limited.

For outputs up to about 5 h.p. the repulsion-induction motor was very popular a few years ago, being the only single-phase motor which would develop a good starting torque. For sizes of from 1 h.p. to 5 h.p., however, attention to the commutator and brushes was required, while its power factor was poor and its maximum duty was limited to about 10 h.p.

Phase-splitting by means of condensers can now be performed at a lower cost than hitherto, and the capacitor type



Starting current (21 A), 97 per cent. of full load; starting torque, 60 per cent.; run-up torque, 36 per cent.; max. running torque, 80 per cent.

Performance curves of a 4-pole, 5 h.p. "Loampstart" squirrel-cage motor (230 V, 1,420 r.p.m., 21.5 A full load), starting with running windings in series, condensers in parallel

motor has therefore been developed. As the angle θ can be made 90° by suitable design, the starting torque can be raised from sin 30° = 0.5 (as in the split-phase type) to sin 90° = 1; *i.e.*, while the starting torque can be doubled, the starting current is only the geometrical sum.

The capacitor design has enabled machines of several types

Left: Large s.p. motor with pulley. Centre: Small "Loampstart" s.p. machine with pulley and slide rails. Right: Enclosed ventilated 3-ph. slip-ring capacitor motor

and of much larger horse-power to be developed than was possible with the repulsion-induction motor. The accompanying table, which gives approximate particulars of single-phase motors available for 50-cycle systems, will enable the type of

H.P.	Type of motor.	Starting torque/ f.l. torque.	Starting current/ f.l. current.	Usual no. of poles. 200 to 250 V.	Usual no. of poles. 260 to 480 V.	Method of start.
1/10th to ½	Squirrel-cage split-phase.	1.5	6 to 7	4	Not suitable.	Direct on line.
1/10th to 1	Squirrel-cage capduction.	3.0	5 to 6	4	Not suitable.	Direct on line.
1/5th to 2	Repulsion-induction.	3.0	4	4	Not suitable, generally.	Direct on line.
1 to 15	Squirrel-cage split-phase.	0.3	2 to 2½	4, 6 & 8	4, 6 & 8	Non-automatic graduated resistance starter.
1 to 30	Squirrel-cage "Loampstart."	0.45	1.6	4, 6 & 8	4, 6 & 8	Non-automatic dble. parallel-series.
1 to 30	Squirrel-cage capacitor.	1.5	4 to 6	4, 6 & 8	4, 6 & 8	Non-automatic parallel-series.
1½ to 50	Slip-ring capacitor.	1.0 1.5	1½ to 2 2½ to 3	4, 6 & 8	4, 6 & 8	Non-automatic parallel-series and rotor starter.

motor most suitable for a particular duty to be chosen by the prospective user.

The split-phase squirrel-cage motor is the simplest type. For small machines automatic starting, and for larger machines, up to about 15 h.p., non-automatic starting can be employed. This type inherently takes a fairly large starting current and develops (especially in the larger sizes) a relatively small starting torque.

The squirrel-cage capacitor motors up to about 30 h.p. can be made with a reasonable starting torque, without taking an excessive starting current. Although in some cases the starting torque developed by a repulsion-induction motor is higher and the starting current is somewhat less than for a squirrel-cage capacitor motor of the same h.p and speed, the latter may cause less disturbance on the line owing to its better speed-torque characteristic; *i.e.*, there is no negative kink in its speed-torque characteristic as there is with some repulsion-induction machines.

A form of squirrel-cage capacitor motor that has been designed primarily to give a single-phase equivalent to a three-phase squirrel-cage motor with star-delta starting is the "Loampstart." By regrouping the running winding from series at starting to parallel when running, the current drawn by the running winding is reduced to about a quarter during starting, all the starting kVA being retained in the form of torque.

The auxiliary phase winding takes full-load current (approximately) and is displaced by about 90° from the running-winding current with the usual values of starting condensers in circuit. The net effective motor-starting ampere-turns are therefore reduced to half, and the starting current is about 30 per cent. of that taken for straight-on starting, the starting torque being about 45 per cent. of full-load torque.

The slip-ring capacitor motor gives similar figures to the three-phase slip-ring type for starting torque and current, and can be made up to 50 h.p. As in many instances standard three-phase parts can be embodied, the standard enclosures for three-phase motors can be used.

Pipe-ventilated vertical 3-ph. slip-ring capacitor motor

Whilst the condenser used with a capacitor motor does help the power factor to a certain extent on single-phase circuits, its main function is to produce the necessary phase displacement between the running and the starting currents and not to correct power factor. We have no doubt that in many instances single-phase motors will be installed in the future where in the past it has been the custom to employ three-phase motors.

Acknowledgments are due to the English Electric Co., Ltd., for the curves and photographs here reproduced.

Condenser Welding of Heating Resistors

A FURTHER communication from the Institute for Heavy Current and High Voltage Technology of the Technische Hochschule, Dresden, relating to the condenser-discharge method of welding described in the ELECTRICAL REVIEW of June 21st last, deals particularly with the application of the method to jointing nichrome and other heat-resisting alloys in the manufacture and repair of electric heating appliances. Data are given by J. Wrana in *Elektrotechnische Zeitschrift* from tests with wires of from 0.004 to 0.016 in. diameter and strips of similar cross-sectional area, using an aperiodic discharge of 10^{-3} sec. time-constant from condensers of several hundred microfarads capacity. Considerably larger conductors can be welded by the use of larger condensers.

The satisfactory electrical quality of the welds is demonstrated by raising the jointed conductor to red heat by the passage of current. Joints between conductors of the same material remain darker (cooler) than the adjacent wire or strip, proving the joint to be of lower resistance; and, on increasing the current till the conductor melts, fusion does not occur at the weld.

MECHANICAL STRENGTH OF CONDENSER-DISCHARGE WELDS IN HEATING ELEMENTS

Materials and sections joined	Tensile strength, % of unwelded wire
Chromium-nickel, 0.012 in. dia.	90
" " 0.032×0.004 in. strip	76
" " 0.055×0.004 in. strip	60
Chromium-nickel to copper, 0.012 in. dia.	83*
Chromium-nickel, 0.012 in. dia. to copper 0.016 in. dia.	68*
Megapyr, 0.012 in. dia.	80
Megapyr to copper, 0.012 in. dia.	95*
Megapyr, 0.012 in. dia. to copper 0.016 in. dia.	85*
Kanthal, 0.012 in. dia.	92
" 0.037×0.004 in. strip	95
Kanthal to copper, 0.012 in. dia.	87*
Kanthal, 0.012 in. dia. to copper 0.016 in. dia.	83*
Kanthal, 0.037×0.004 in.:	
To copper, 0.012 in. dia.	87*
To copper, 0.016 in. dia.	77*

* Referred to the copper conductor.

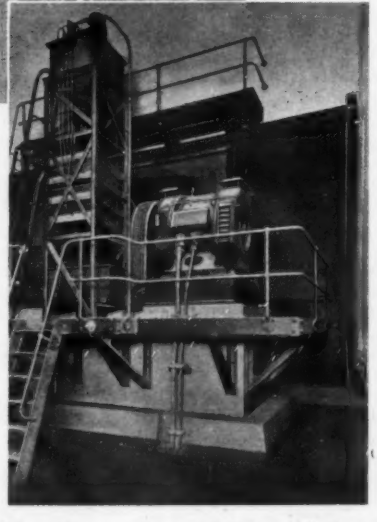
It is found that a resistance element welded to a copper lead remains dark for 0.039 to 0.079 in. from the weld when the resistor is at working temperature, and failure occurs away from the weld on increasing the current. The accompanying table shows the average tensile strength of welds between unannealed wires and strips. Annealing reduces the strength of the welds less than that of the wires, and tensile fracture at temperatures near the melting point always occurs away from the weld. The fact that fusion in welding is restricted to the immediate vicinity of the joint is one of the most important advantages of the condenser-discharge method.

In welding chromium-nickel wires by the two-stage process (explained in the earlier article) of forming balls on the ends of the wires by a preliminary discharge, there is sometimes a tendency for the balls to oxidise (if iron is present), in which case the reliability of the joint is affected. Good results are obtained by overlapping the ends of the wires or strips at the joint. This method is also applied to welding copper leads to chromium-nickel strip, care being taken to bring the wire and strip into contact for a distance equal to about twice the diameter of the wire, otherwise notches may be burnt in the strip. Excellent results are obtained in welding the special heat-resisting alloys megapyr (30 per cent. Cr, 5 per cent. Al, 65 per cent. Fe) and kanthal.

Investigation of the electrical characteristics of condenser welding shows that the same energy of discharge is required to weld conductors of given size using condensers of different capacities. The requisite welding voltage U volts and the resistance R ohms determining the time-constant may be calculated from: $U=[(40+\sqrt{kd^3})\ 27.8/\sqrt{C}]$ and $R=1000/C$; where d=dia. of wire, in mm.; C=capacity, in microfarads; and $k=0.8\times10^6$ for copper, and 1.2×10^6 for chromium-nickel, iron, megapyr and kanthal. The value of k for copper should be used if one of the conductors is of that metal. An average or equivalent value of d is used when welding wires of different sizes, or wires to strips of usual proportions. The value of U thus determined is the voltage to be used for the first or ball-forming stage. About 10 per cent. higher voltage is used for the actual welding operation.

Ventilating the Mersey Tunnel

THE necessity for adequate ventilation of the Liverpool road tunnel under the River Mersey is indicated by the fact that during the first year the tunnel has been in public use the number of vehicles that passed through it totalled 3,002,362—over one and three-quarter millions more than the estimate, the revenue of £250,143 being nearly double the estimated income. When the installation was described in our issues of May 25th and July 20th, 1934, the central control room had not been built. It has since been completed and the system of operating the ventilating plant by central control has been fully established.



The central control room at the George's Dock ventilating station and (right) a typical 350-h.p. "Metrovick" motor driving a 25-ft. diameter blower fan

Used air is withdrawn from the tunnel and fresh air blown in *via* ducts formed under the roadway and passages under the kerb at each side of the road. The six ventilating stations, three on each side of the river, are equipped with thirty motor-driven fans having impellers ranging from 7 ft. 6 in. to 28 ft. in diameter and from 3.35 to 23.75 tons in weight. They are driven by "Metrovick RS" squirrel-cage motors totalling 5,140 h.p. in capacity, and ranging in output from 30 h.p. at 720 r.p.m. to 430 h.p. at 735 r.p.m. They are designed specially for silent running. The fans and motors are arranged in pairs (that is, two fans per duct), one set serving as a standby to the other.

Every motor has two distinct windings on the stator, giving alternative speeds and outputs. Also, in each pair of motors the low speed ratings are varied so that from every pair three alternative high efficiency ratings are available, while still further adjustment of output can be made by varying the speed of the fan by means of a hydraulic coupling provided between the motor and the reduction gear through which the fan is driven. In the accompanying right-hand photograph the coupling is shown protected by a perforated screen on the left of the motor. In front of the reduction gear is a steel framework carrying the gravity supply tank, drainage tank and four coolers used in connection with the supply of liquid to the coupling. The actual starting of the fan motors is done by electro-magnetic contactors actuated by push buttons and mounted, together with protective relays, instruments and indicators, in separate sheet-steel cubicles.

Electricity is delivered by alternative feeders from the Liverpool Corporation's system on one side of the river and from the Birkenhead Corporation's on the other. Thirty-two three-phase, 50-cycle transformers (5,950 kVA total capacity) step down the supply from 6,000 and 6,600 V to 400 V and 230 V. The h.v. circuits are controlled by K-type metal-clad breakers and the l.v. circuits by SF-type metal-clad switchboards.

All signals and control impulses to and from the central control room are transmitted through direct pilot wires in multi-core cables. The impulses are received by interconnecting relays which cause indicating lamps to glow, or actuate contactors for starting motors.

In each ventilating station is a panel equipped with separate integrating watt-hour meters for each of the h.v. supply feeders. These meters are summated by a third integrating meter, which is fitted with a maximum demand indicator and a thirty-minute interval time switch, its readings being transmitted for further summation to the central control room. Each station also has a panel equipped for indicating and transmitting to the central control room the rate of air flow in each duct, and also the visibility of the air within the tunnel; an alarm bell will ring in the event of the visibility being reduced by the presence of smoke or fog. There are also two separate analysers which measure continuously the proportion of carbon monoxide in the tunnel atmosphere, one having a local indicator and local alarm device, while the other operates a remote indicator, chart recorder and alarm bell in the central control room. The panel is also equipped with a telephone, a clock, and an alarm indicator and alarm bell.

In the central control room are two control boards and an eleven-panel semi-circular recorder board. There are mimic diagrams with red, green, and white lamps which show the h.v. switch positions and semaphore position indicators for the l.v. circuit-breakers, together with instruments and signalling and alarm circuits.

The eleven-panel semi-circular recorder board gives indications of conditions relating to three drainage pumping stations situated at mid-river and at the docks on opposite sides of the river. It also contains water measuring instruments, double- or triple-scale air flow recorders, visibility recorders, CO recorders, fog detector recorders, vehicle counters and a summation meter which integrates the kWh used and shows the maximum demand for all energy consumed.

The plant is capable of great flexibility of output to meet widely varying conditions, and great care has to be taken to ensure the utmost reliability by the provision of alternative supply cables and by duplication of plant. Control can be effected either from within each ventilating station or from the central control room. The operating engineer has continuous indications which enable him to open and close circuit-breakers and start, stop or regulate the speed of any of the ventilating units.

All the motors, transformers, and switch and control gear for the tunnel ventilating equipment are of Metropolitan-Vickers manufacture, and the number of pilot wires is reduced to an economic minimum by a system of graduated current impulses, which allows a number of different signals to be sent over the same line.

Arc Welding Plant

A NEW Standard Specification (No. 638/1935) which standardises the method of rating metal arc welding equipment is in two sections. The first lays down the rating for welding sets of the non-automatic and automatic types and also of the single and multiple arc types; electric motors; reactors, transformers and resistances. It also provides for flexible cables of a special construction suitable for use with the electrode holders which will ensure as light a cable as possible, with the requisite mechanical strength and yet providing adequate flexibility. The second section of the specification deals with safety appliances and lays down requirements for welding accessories, such as electrode holders, hand shields, helmets, screens, gloves, aprons and similar equipment.

Two further specifications, one relating to bare wire (No. 640) and the other to covered electrodes (No. 639), provide for welding wrought iron or mild steel not exceeding 33 tons per sq. in. The three grades of bare wire electrodes are differentiated by the chemical composition of the wire, which is laid down in detail. The four grades of covered electrodes are differentiated according to the mechanical properties obtained from all-weld-metal test pieces. No chemical composition, either of the core wire or of the flax covering, is specified for covered electrodes, but a clause on strength and stability of the coating is included. Other requirements relate to the size of core wire tolerance on size workability, number of tests, &c., while details of alternative methods by which the all-weld-metal test pieces can be obtained are given.

Meetings and Discussions

An Electrically Propelled River Boat

A Diesel-electric Paddle Boat
The Efficient Use of Coal
Advantages of the "Electric"

THE Diesel-electric paddle boat *Talisman* is described in the paper by Mr. G. A. INGLIS that was read before the INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND on December 17th. This vessel was built for the London & North Eastern Railway Co. for service on the River Clyde, and is 223 ft. long, having a displacement of 528 tons and a mean speed of 17 knots. The English Electric Co., Ltd., supplied the electrical equipment. Economy in fuel is certainly an attractive feature, but the increased space due to the engines being under the deck; the ability to alter the speed instantaneously as the conditions of service might require; the convenience of starting at short notice; and the ease of refuelling were other factors which influenced the owners to have a ship in which all services from propulsion to carpet-sweeping would be carried out electrically.

Transmission by d.c. was preferred, since it allows the speed of the shafts to be varied while the engines run at constant speed, with a double-armature motor connected directly to the shafts. The weight of this motor (44 tons) was an objection, but the weight of 170 tons for the whole machinery installation being less than that of triple-expansion machinery with a cylindrical boiler, and its centre of gravity no higher, the simplicity of the arrangement was considered to compensate for the disadvantage in weight.

The motor's normal output is 1,300 b.h.p. at from 48 to 50 r.p.m., and it is shunt wound. The armatures, being separated electrically, are arranged so that either, with its own field winding, can be cut out of circuit. Heaters of the tubular type have been fitted to the bottom half of the magnet frame for preventing condensation on the winding when the plant is shut down. The motor is ventilated by two motor-driven fans, having an output of 16,000 cu. ft. of air per min. and situated immediately below the propelling motor.

Each of the four diesel engines is directly coupled to a 284-kW main generator and 36-kW auxiliary generator in tandem. Each has a full load voltage of 295 and an efficiency of 93.5 per cent. The auxiliary generators are designed to supply the excitation and all auxiliary load at 220 V, and are arranged so that one machine carries all the excitation, two carry the auxiliary load and the remaining one acts as a stand-by. A 20-kW diesel-driven generating set is provided for use when the main diesel sets are shut down, and this can be connected to the ship's auxiliaries, but it is not used for excitation.

A 2-kW diesel lighting set is fitted behind the propelling motor. All the deck and engine room auxiliaries are driven electrically, and control of the speed and direction of rotation can be exercised from the bridge or engine room, on the Ward-Leonard principle.

In her summer season the *Talisman* ran regularly seven days each week and covered 10,120 nautical miles, an average of 110 miles daily, calling at more than thirty piers each day. The average consumption of fuel oil was 1.47 ton per 100 miles, including stand-by losses; this compares with 11¼ tons of coal used in the same distance by her predecessor, a steamer of the same length but 160 tons less displacement, and driven by a single engine with a haystack boiler.

Four engines are used for express trips, but three are sufficient when the time-table is not exacting, and with only two engines a speed of over 14 knots can be maintained.

The air gap of the propelling motor has shown no measurable change since going into service early in June, and the main motor does its work with such ease that it might be rated at a considerably higher power; in fact, the whole system holds out the prospect that the ratio of power to weight may be sensibly increased in the future.

* * *

Coal and its Efficient Use

IN his presidential address to the JUNIOR INSTITUTION OF ENGINEERS in London on December 13th Sir FRANK E. SMITH, Sec.R.S., secretary of the Department of Scientific and Industrial Research, pointed out that between 1913 and 1934 the number of miners employed in this country had fallen by 320,000 to 784,773; coal-cutting machines in use had increased by 4,511 to 7,406, machine-cut coal had increased by 79.3 million tons to 103.7 millions, and the output per man shift had grown by 5.1 to 22.9 cwt.

Sir Frank then summarised the speculations of chemists concerning the structure of coal, remarking that before proper use could be made of any substance the chemical structure of the raw material must be known. That key, when found, would open the door to progress, leading to entirely new industries.

The decrease in the home consumption of coal, by 22.4 million tons to 161.5 millions between 1913 and 1934, was due to what was commonly called fuel economy. But Sir Frank preferred to call it increased efficiency in transforming the latent energy of the fuel into useful kinetic energy, the best illustration of which (because it could be worked out with great exactitude) was the production of electricity. In 1934 on the average 661 tons of coal was used to produce one million kWh; that was less than half the amount per kWh used in 1920. If no improvement in methods had been introduced since 1920, the production of the electricity used in 1934 would have needed 24,060,000 tons of coal, or 12,890,000 tons more than was in fact required. The figure of 661 tons was an average; some power stations had a much greater efficiency than the average. Indeed, the Battersea station, and Sir Frank believed there was no other in the world more efficient, had a coal consumption as low as 407 tons per million kWh output. If all the generating stations in this country were equally efficient, there would be a total saving of coal of 17 million tons on the basis of their coal consumption for 1920.

There was, however, still room for improvement, and fifty years hence electrical engineers might smile at our pride in having attained a thermal efficiency of 29 per cent., for even though it was a great achievement, that was all they had so far attained. This feat of the engineer in converting the latent energy of coal into electrical energy was very striking, but only part of the increase was due to increased efficiency in burning coal. There were also improvements in boilers and in furnace design to be taken into account.

Similarly improved efficiency in other industries had reduced the amount of coal they needed. Sad as was the immediate effect on the coal industry the decreased consumption of coal through its better utilisation must be welcomed. If it were checked the industrial productivity of the nation would also be checked. Preventable waste was always bad economics, and must finally be a hindrance to progress, whereas better utilisation would lead in the end to an increase of demand.

* * *

Generating Electricity as a By-product

THE paper in which MR. S. B. DONKIN advocates the supply of heat from stations generating electricity as a by-product, to which reference was made last week, was discussed at the INSTITUTION OF CIVIL ENGINEERS in London on December 10th. SIR MURDOCH MACDONALD said that any suggestion for the conservation of coal resources, such as the proposals of the author for central heat production, was to be highly commended. With such a scheme adopted on a large scale the conflict between gas and electricity would be accentuated, because then electric power would be produced as a subsidiary at possibly very cheap rates, and so far better able to compete with gas. The paper also showed the possibility of developing the central distribution of hot water, whereby the smoke pall of towns would be largely obviated, with considerable benefit to the health of the community. Such a scheme could be considered when planning new towns. In London, it was possible that in the future all gas, water, and hydraulic pipes and cables would be carried in tunnels; hot water distribution might then become a possibility. In the opinion of MR. J. M. DONALDSON the crux of the matter was the balancing of thermal and electrical requirements. He pointed out that, unlike Russia, Germany and the United States where central heat production was a success, we often experienced warm weather in winter; the variations in the requirements from year to year, and month to month, to keep the temperature in his own greenhouses uniform throughout the winter were very marked. The figures given relating to the sale of steam seemed to be far too high, and should possibly be reduced by one-half. MR. A. H. BARKER pointed out that in Russia and the United States it was almost impossible to live in houses that had no central

heating, whereas the Englishman, as a rule, did not like central heating. It was possible to carry out the scheme proposed, but it was questionable whether it could be done with profit. The heat requirements in houses varied. Investigation showed that in the case of a professional man it amounted to 11,000,000 B.th.u. per annum, and in that of a workman to 3,000,000 B.th.u. per annum.

MR. FOWLER said that an accurate estimate of the real heat and electricity requirements was needed. In opening up a new district they could not deal in generalities, but had to put forward definite figures for the cost of heat that would attract consumers. What was needed first was an accurate gauge, or estimate, of the heat requirements to be supplied. An attractive feature was that the heating peak load would not coincide with that of the electricity supply.

That the attainment of such high efficiencies as were referred to in the paper had no significance whatever unless an economical sale was obtainable for the heat was stated by MR. C. E. H. VERITY. Of the four Russian stations mentioned in the paper, the two most efficient were practically pure heating plants, which accounted for their good performances.

MR. J. KENNEDY said the problems involved were not simple, as they concerned the relationship between power and heat requirements. The use of its coal was the be-all and end-all of the nation, and the existing depression would not end until they got back to the extent of use of 1911. Basically, the paper was concerned with another method of using coal. The question was whether it was the best for the benefit of all. In 1926 a national pool of electricity generating resources was arranged, and already it had been seen that it was better to transmit energy by wires, than coal in railway wagons.

It must not be forgotten, said MR. A. MONKHOUSE, that the paper concerned industrial and surplus heat, rather than domestic heat. The last requirement was a very variable one, but the industrial needs could be more easily foretold. The needs of horticulture were difficult to estimate, but the proposed supplies were all surplus, and would otherwise be thrown away. Variations in the temperature for such requirements could be met by putting the water through the condensers at different speeds.

* * *

An Electric Vehicle Conference

A SUCCESSFUL electric vehicle conference organised jointly by the North-West Area Electric Vehicle Committee and Mr. E. Moxon, borough electrical engineer of Southport, was held at the Southport electricity showrooms on December 12th. The proceedings opened with an inspection of a group of vehicles by Electricars, Ltd., the Metropolitan-Vickers Electrical Co., Ltd., A. E. Morrison & Sons, Ltd., Partridge, Wilson & Co., Ltd., and Victor Electrics, Ltd. Special wiring had been installed for charging them in position. The vehicles were subsequently dispatched on a parade round the town. Traction batteries by the Chloride Electrical Storage Co., Ltd., the D.P. Battery Co., Ltd., and the Tudor Accumulator Co., Ltd., were also displayed, together with chargers by Partridge, Wilson & Co., Ltd., and the Westinghouse Brake & Signal Co., Ltd.

In the morning and afternoon meetings were held in the demonstration hall, when informal discussions were opened by MR. R. L. ACLAND and continued by electricity supply engineers, of whom a large number were present, vehicle users and manufacturers. Similar conferences are to be arranged in other centres by the Electric Vehicle Committee of Great Britain, Ltd.

In the course of his address Mr. Acland said that it was necessary in road transport that every phase of the moving should be carried out with the ideal vehicle, thus ensuring the greatest economy and highest profits. No one vehicle was equally suitable for every job. If a light load had to be delivered quickly 25 or 50 miles away, a 1-ton lorry would be efficient and a 5-tonner wasteful; whereas for a big load to go a long distance a 5-ton lorry would effect a big saving over several small ones. In just the same way the electric vehicle was by far the most economical for house-to-house delivery or collection within a prescribed area, or on any service which entailed many stops and starts.

The transport manager of a big distributing company in London with a large fleet of small vehicles delivering milk and foodstuffs from house to house over a wide area had put the cost of a petrol van at £4 per week as compared with that of the electric at £2 4s. 6½d. per week, exclusive of driver's wages in each case. This firm had found from experience that a petrol van could be calculated to last only three years on such work. Owing to the simplicity of its action and the reduction of wear and tear to the minimum, an electric vehicle could be usefully employed for a far greater number of years than any other type.

A big London store had stated that the electric vehicle was the cleanest, most reliable and economical means of transport when properly applied. It had had sixty-six electrics operating over 20 years on local deliveries, and they appeared to be good enough for a much longer period. Again, a borough council had employed fourteen 50-cwt. electric vehicles for the past 14 years on house-to-house refuse collection from some 30,000 houses. During the last year of this period the total time lost owing to failures from one cause or another, including five hours for accidents, had amounted to only 13¾ hours, or 0.04 per cent. of the total possible time that could have been worked. Each vehicle had run over 50,000 miles. It would be to the advantage of every firm employing transport to examine its system and see if there was an opening for the employment of an electric, not merely with the idea of being up to date by "going electric," but for the sound business reason that it would save money in the handling of certain goods at present moved by other means. The simplicity of construction and operation resulted in low maintenance and distribution costs, exceptional reliability and unparalleled ease in driving.

The battery, which might give rise to some doubt in the mind of the prospective user, could be rented under a hire-maintenance agreement, for a fixed sum per annum, under which it was kept up to a definite standard of efficiency by the manufacturer. No allowance need, therefore, be made for depreciation or repair in this direction as new batteries were provided when needed and the only cost, beyond the fixed rental, was that of the charging current, the rate for which, from a large number of electricity supply undertakings, was only ½d. per kWh when taken during specified hours. Recharging the battery was a simple operation and no skilled attention was required.

* * *

The Buxton Testing Station

THE Mines Department testing station for flameproof enclosures of electrical apparatus was, as mentioned last week, described to the London Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS in London on December 10th by MR. H. RAINFORD (testing officer). In the discussion which followed MR. J. A. B. HORSLEY (H.M. Electrical Inspector of Mines) said that the Mines Department was not content to certify apparatus on its bare ability to pass the tests, severe as they might appear to be. From the beginning it had determined that there must be an ample margin of safety, not only with regard to the gaps between flanges or the clearances at shaft glands, but also with respect to the strength of the structure. The great increase in the amount of work being handled at the station had recently necessitated very nearly doubling the floor space of the testing chamber. It was likely that the work would increase, for the Factories Department was becoming increasingly interested in the problem of flameproof enclosure with respect to certain inflammable gases met with in industry.

Mr. M. G. R. ELLIOTT said that the Buxton testing station had been of very great assistance both to the user and the manufacturer of flameproof apparatus, because it had set a definite standard, but he pointed out that none of the apparatus was tested under actual working conditions, *i.e.*, with the current on. He urged that standardisation should be arrived at quickly because developments in certain directions might be held back until it was known what the final conditions would be. Some factory requirements were much more stringent than mine requirements, so that a range of apparatus manufactured to meet mining requirements would not necessarily meet factory requirements.

DR. W. ZWANSIG suggested that it would be useful to have a standard fixed for cable glands; accidents had occurred through bad fixing of the cable in the glands. MR. S. W. RICHARDS maintained that distinctive marks should be applied to apparatus to indicate which particular tests the apparatus had passed. MR. C. BAGULEY said that although certificates could be issued with regard to tested apparatus, one could not give a guarantee as to what would happen to the apparatus in the course of its useful life. Was it possible, when the cover was removed only at long intervals, for the relief gap to be interfered with to some extent by clogging?

MR. S. J. ROSEBLADE said that in practice there might be repeated internal explosions due to internal ignition of gas. A fabricated steel cover plate would revert to its normal shape after each distortion, so that there would not be the same permanent distortion as in cast iron.

MR. RAINFORD, replying to the discussion, said that gener-

ally a terminal box was of comparatively small size in relation to the main enclosure, and it was not considered necessary to subject it to test in that case; examination was sufficient. But when the terminal box was larger in relation to the main enclosure, for instance, a controller might have a terminal box running along the entire length of the enclosure, and it was considered necessary to test it from the point of view of the strength of the structure. A test with circulating gases gave a condition slightly more severe than test with the rotor stationary or running normally. The principal effect of turbulence was a slight increase of maximum pressure, and, more important still, an increase of the rate of development of pressure, due to the fact that a mixture in turbulence allowed the flame to travel more rapidly through it.

With regard to factory requirements Mr. Rainford could not anticipate anything, since research work had been instituted, and until the fundamental data were obtained in respect of other industrial gases the requirements could not be fixed. There were various types of cable entry, and a gland was not relied upon to complete the flameproof design, except for a very small terminal recess where the volume was so small as to allow of some concession in that respect. The best way was to apply the cable by a plug-and-socket connector which had been certified as a separate entity.

In the majority of instances apparatus was tested with all parts fitted, for the simple reason that the amount and the disposition of the fittings inside might affect the type of explosion which occurred. Test fees were assessed on gross volume, whereas the net volume was the actual gas space, and enabled one to calculate the mixture required to be swept through to remove air initially present.

The definite provision of a venting gap at a flanged joint was ruled out, and the joints were close fitting. The maximum permissible gap was 20 thousandths of an inch, but in practice such a gap was not provided, and it was not desired; he preferred a close-fitting joint, with a space of only 1 or 2 thousandths. Release of pressure was not definitely aimed at; it was desired that an enclosure should be strong enough to withstand an explosion without release of pressure, partly for the reason that a vent might become choked.

* * *

Discharge Lamps

IN a lecture delivered to the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS in London on December 17th Mr. W. RULE described the mechanism of conduction and of light production in discharge tubes together with the operational characteristics of discharge lamps, including high- and low-voltage types, the sodium lamp, and the dual lamp combining a tungsten filament and mercury vapour in the same bulb, which can be connected direct without requiring a choke or condenser. Broadly the sodium lamp originated on the Continent and in the United States, whereas the mercury-vapour type was a British development and was dealt with at greater length by the lecturer.

The latest type, which was still in process of development, was a super-high pressure quartz mercury-vapour lamp. In the very early forms the phenomenon of cathodic sputtering restricted the current which could be used and therefore the operating pressures of the gas or vapour filling. This difficulty was overcome by the use of hot cathodes and the modern high-pressure lamp operated at pressures up to one atmosphere and the envelope temperature was 450 deg. C.

It had long been realised that an improved lamp would result if the pressure of mercury vapour was still further increased. The limiting factor had been the use of a transparent material which could be used at still higher temperatures to produce high operating pressures. Quartz was the obvious material which fulfilled the conditions, but it was only recently that methods had been evolved whereby vacuum-tight seals, suitable for this particular application, could be made.

In the super-high-pressure mercury-vapour discharge lamp the envelope was a short piece of thick walled quartz tubing into each end of which was sealed a tiny electrode having thermionic properties. The lamp consumed about 70 W and operated at about 40 atmospheres, the envelope temperature being from 800 to 900 deg. C. The efficiency was about 50 lumens per watt.

The lamp was very small and the intrinsic brilliancy very high. The colour rendering was improved, for in addition to the broadening of the spectral lines the background of continuous radiation was increased and the normal red deficiency decreased. When water cooled, the lamp could be operated at much higher wattages and pressures and the features outlined were enhanced. It would prove extremely useful in projection work because of the high intrinsic brilliancy and would find application as an ultra-violet source.

The Case for the Standard Plug

THE British Standards Institution informs us that inquiry throughout the electrical industry in 1933 showed an overwhelming majority in favour of complete interchangeability of plugs and socket-outlets for domestic purposes. This view was unanimously endorsed by the Council of the Institution of Electrical Engineers, and the tenth edition of the I.E.E. Wiring Regulations stipulates that "every plug and socket-outlet shall conform in all respects to the appropriate British Standard Specification." The adoption of a plug having standardised dimensions and complying with safety requirements was intended for the convenience and safety of the public, and for the convenience of the manufacturers and for suppliers, who are compelled to carry stocks.

The Electrical Industry Committee of the B.S.I. points out that an appliance fitted with a standard plug might later be required to be connected to a non-standard socket-outlet, and if such a connection can be made at all, bad contact may cause danger, while if connection cannot be made the plug may be removed from the flex and the bare ends of the wire pushed into the socket, again introducing a risk. Further, the use of non-standard plugs and socket-outlets will encourage the use of plugs with adjustable contacts, once more introducing potential dangers. Apart from the question of danger, many complaints of interference with broadcast reception are due to badly fitting plugs.

Complete interchangeability between electric lamps and their holders is essential in domestic premises, and technical improvements in lampholders have not been restricted by standardisation, and on similar grounds of convenience of the public (and quite apart from safety considerations) interchangeability of plugs and socket-outlets is justified. The Electrical Industry Committee holds that technical development should be directed rather to improving the existing standard type than to the introduction of alternative types.

The I.E.E. Wiring Regulations require the installation of an earth wire to almost every socket-outlet, the use of a two-pin (non-earthed) plug complying with the Regulations in only a few cases; also a plug containing a fuse must be non-reversible. The two-pin (non-earthed) plug is, therefore, virtually ruled out for all new installations.

The exclusive use of plugs and socket-outlets for domestic purposes that comply with British Standard Specification No. 546 would secure the following features: (i) Safety from shock during insertion and withdrawal of the plug; (ii) non-reversibility, thus ensuring that single-pole switches on the appliances comply with the I.E.E. Wiring Regulations; (iii) fused plugs can be used in accordance with such Regulations; (iv) standard ratings, corresponding to the standard ratings of fuses, are provided. (A rating of 10 A is non-standard and is not permitted by the Regulations); (v) the earthing requirements laid down in the Regulations can be complied with.

All manufacturers of portable electrical appliances who are members of the B.E.A.M.A. and almost all non-members are now sending out their appliances fitted with three-core flex, to the free end of which a label bearing the following words is attached: "Earthing. This flexible is intended for use with a three-pin plug and socket. The brown lead should be wired to the earthing terminal on the plug. Under no conditions should the brown lead be connected to the supply terminals. If your installation is fitted with two-pin plugs and sockets consult your electrical supplier."

Rural Electricity

A paper reviewing recent developments in rural electrification was read by Mr. D. Ross at the Scottish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS at Edinburgh on December 10th. Mr. Ross enumerated the advantages of single-phase distribution, and considered the design of transformers and their capital and running costs, making suggestions for standardisation of sizes. Methods of obtaining cheap and reliable protection on the h.v. system by means of simple switchgear and fusegear were illustrated. He recorded the difficulties encountered in some rural districts in obtaining adequate earths, and made a strong recommendation that "all insulated" installations should be adopted wherever practicable, and that in all other cases earth-leakage switches should be employed.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Assessments and Fixed Charges

The assessing of fixed charges of two-part tariffs upon the basis of the rateable value leads to many anomalies.

In my own experience I have had the remarkable opportunity of noting that there were sitting on the local Rating Assessment Committee, members of the local Electricity Committee (including the chairman), and when I pointed out that in maintaining what I thought was an unduly high assessment for my house, they were at the same time preventing me from using electricity under the two-part scheme owing to its high cost, the said members of the Electricity Committee had no comment to make, and I was informed by the chairman of the Rating Assessment Committee that my remarks on this count could not be noted, as his Committee was a county one.

I have reason to know that many people are becoming good customers of our gas friends owing to this sort of thing. Surely a better method could easily be devised in which the fixed charge for domestic use would be zoned according to the average maximum demand such supplies would take. In view of the Distribution Committee, which is now sitting, I think you will agree that this question is a live one, and no doubt many of your readers will find themselves interested.

December 13th. ENGINEER AND CONSUMER.

The Training of Jointers

Having read of the certificate scheme which the Institution of Automobile Engineers launched some months ago whereby mechanics and electricians are qualified by written and practical examinations, I wonder if such a scheme would be acceptable to electricity distribution departments.

I feel that such a scheme would be of great practical advantage to jointers and their mates. It would have the effect of raising the status of the ambitious jointer and would attract the best type of man into the jointing side of the industry. The jointer would then possess a diploma certifying that he had proved his capabilities both practically and theoretically and could be classed as a craftsman. The would-be employer would have a guarantee as to the man's capabilities.

There should be both practical tests and a written examination. Arrangements could be made for candidates to sit at existing technical schools and these schools could provide a course of training in cable-jointing. At present there do not appear to be many facilities for the jointer to become more intimate with his job and to extend his knowledge, or to assist the ambitious mate who desires to become a craftsman.

December 13th. WILLIAM MASKERY.

Motor Car Voltages

Replying to Mr. E. G. Ford's letter in your issue of November 15th, which I have just seen, the greater ampere-hour capacity obtainable for a given weight of 6-V batteries, as compared with 12-V, is no advantage, seeing that twice the current is required.

I am not in a position to express an opinion on the other advantages which Mr. Ford claims, but I hope that they are more reliable than this one. W. HOLTTUM.

Birkenhead, *December 10th.*

The letter from Mr. E. G. Ford in your last issue is interesting but is not sound in some respects. Since the lamps and starter motors on 12-V circuits take half the current of those for 6 V, the ampere-hour capacity of a 12-V battery need be not more than half that for 6 V. It should be noted, also, that the brush, commutator and other circuit losses are relatively much lower on 12 V. Hence, for the same service in starting, a 6-V battery would not appear to have any advantage in weight.

With regard to lamp renewals, it may be remarked that 6-V lamps on cars are quite often under-run except when the battery is charging. It is quite likely, therefore, that the alleged shorter life of the 12-V lamps is due, not to mechanical damage, but to the higher average voltage at which they are run. A batch of 4-V 3-A lamps, which I tested some time ago, were evidently over-run and burnt out in a few hours with 4 V across the lamp terminals. It was clear that the makers had allowed for some circuit resistance, because replacements showed normal brilliancy and had a reasonable life.

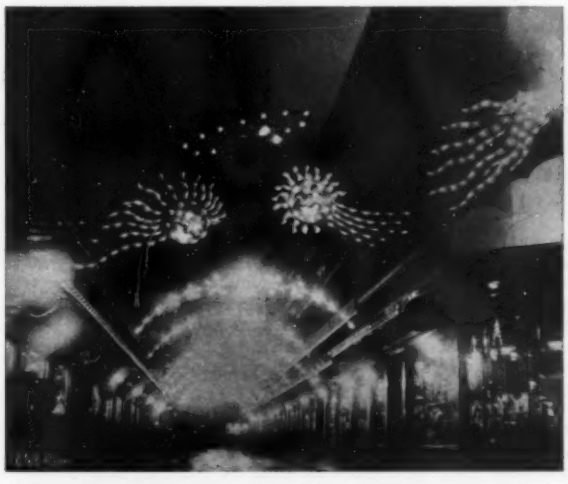
It is suggested that comparative tests on 6-V and 12-V outfits might prove that, for the same starting conditions, a 12-V battery had the longer life. W. H. LAWES.

Portsmouth, *December 14th.*

Lighting Intensity and Glare

In the "Correspondence" columns of your issue of October 18th Mr. L. C. Grant made some comments concerning glare. With equipment now available comparative relative readings are readily obtained. Since glare is more or less a physiological subject the aid of the oculist must be called in for a final definition.

When one considers that variations of between 500 and 1,000 ft.-candles are not uncommon in normal daylight it does not



Christmas illuminations on an elaborate scale are once again to be seen in Paris. The work is carried out largely by the large department stores and one example is illustrated above

seem necessary to stress the desirability of close uniformity, as an average value of illumination gives only an indication of the result.

Take, for instance, the Thompson Institute for Plant Research at Yonkers, N.Y. One room measuring 10 by 10 ft. has twenty-five 1,000-W lamps installed in it about 10 ft. from the plane illuminated. Measurements indicated an intensity of 600 to 800 ft.-candles and there was no particularly noticeable glare.

It is to be hoped that in the near future we may be able to obtain some definition of glare that is susceptible to practical application. C. O. VON DANNENBERG.

Jamshedpur, India, *November 23rd.*

A Christmas Letter

The ELECTRICAL REVIEW has a curious knack for hitting the nail on the head, whether intentionally or accidentally, I do not know. The last time you did it you said that "E.I.B.A. should be everybody's organisation." In to-day's issue you have a note headed "The Benevolent Association" conveying the impression that E.I.B.A. is the Benevolent Association of the industry, and that is exactly what it is, and what we are endeavouring to get into the minds of every person engaged in the industry. The sectional benevolent, superannuation and pension funds must necessarily exist for the benefit of people engaged in those sections, and also necessarily such funds have their rigid constitutions and rules, and because of that they cannot possibly deal with the many exceptional cases that constantly arise.

Such cases are where a person cannot keep up the payments or where he breaks up from accident or illness before he can work for the necessary number of years to obtain a pension; and the hardest cases of all are those of the dependants of the pensioner left destitute, because, of course, the pension dies with the person.

I have been astonished at the number of our beneficiaries who have been, some for thirty years, on the benevolent funds of the section of the industry they have been employed in, where for some reason that cannot be overcome, the pension or allowance has been totally inadequate for existence, some amounting to as little as two shillings per week and others to fifteen. In a recent case the employing company had made compassionate allowances for months at half pay, and so on, but it is obvious that such gratuitous allowances cannot be continued indefinitely. These unfortunate people when they have heard of E.I.B.A. have come to it for assistance and

have received it. More than half our beneficiaries are women, which speaks for itself, plainly showing the extent to which E.I.B.A. helps the unprovided-for dependants of men who die in the electrical service.

All the foregoing is entirely apart from the hundreds of employing undertakings where there is no benevolent or pension fund and where a man, when he can work no longer, has to shift for himself. Can anyone tell me to whom, other than the Public Assistance authorities, these unfortunate people can apply for help? There is no help for them in the industry but E.I.B.A., and is this not an overwhelming argument for support of the Association from every section of the industry?

Those who formed E.I.B.A. were very wise in foreseeing its ultimate value to the industry when they abstained from writing a rigid constitution and compiling rigid rules. In consequence of this there are only two essentials for obtaining help from the Association, one is *need* and the other *previous employment in the industry*; previous subscriptions are not even essential.

The Association's Relief Committee is able to deal with every case on its merits, and there is hardly any limit to the kind of assistance it can render, even going so far as it did recently in educating a particularly bright boy of 13 years of age, and keeping him at a school where he would be given a chance in life. His father, an electrical man, of course, was accidentally killed and his headmaster found that he had neither relative nor friend in the world, and goodness only knows what would have happened to him if this headmaster had not discovered the existence of this Association.

A. HUGH SEABROOK,
Executive Officer, E.I.B.A.
36, Kingsway, W.C.2, *December 13th.*

Electrical Developments in Germany

THE proceedings of the German Electrotechnical Association (V.D.E.) at its Hamburg meeting last summer revealed continued advance in every branch of German electrical practice. The papers presented and the discussions thereon have now been published in a volume* of exceptional interest. Altogether there are forty-seven papers grouped under the headings: Power stations; network operation; switching phenomena; construction of networks; switchgear; rectifiers; machinery; traction; driving and lighting; wireless; communication engineering; and measurements. The individual papers are models of compression and, as little short of full translation would do justice to their contents, readers conversant with German are recommended to refer to the original.

Little is being done in the construction of new power stations in Germany at present but the consumption of electricity continues to increase and the surplus generating capacity available after the crisis of 1929 is coming into service. Matters receiving special attention are the advantageous interconnection of bulk supply and local generating systems, improvements in boiler flexibility and efficiency, and the potentialities of the Krämer mill-furnace. The processing of coal for the manufacture of motor fuels opens new possibilities in the generation of electricity at pit-head works. Other problems of special importance relate to the control of private industrial generation in conjunction with process applications of steam, and the economics and technology of local power stations for peak and stand-by service in relation to base-load systems.

The growth of interconnected networks introduces special problems of voltage control at the sub-stations and of variable phase compensation on transmission lines. These are among the subjects of papers at the Hamburg meeting, with special reference to low- and high-speed switches for regulating transformers, and practical experience in the use of regulative banks of static condensers.

Investigating Switchgear Phenomena

A new section in the classification of this year's papers is that devoted to switching phenomena, particularly the amplitude and course of voltage and current transients. The development of the cathode-ray oscillograph has facilitated quantitative investigation of these phenomena in general, and the perfection of oil-less switchgear and fuses in particular. Researches now in progress should reveal valuable information concerning the insulation characteristics of switchgear and the voltage characteristics of circuits immediately after the extinction of the arc; the conditions in practice may be more severe than those of the test-bed. Further developments have taken place in the construction of compressed-air switchgear, and in the simplification of automatic and manual installations.

Distribution problems of special importance in Germany at present relate to the need for increasing the capacity of low-voltage networks to carry domestic heating, cooking and industrial loads, and, on the other hand, the economic necessity of keeping expenditure on new copper down to a minimum. The meshing of radial networks, is, in many instances, an economical and effective means of improving voltage conditions and carrying additional load. The allowance of higher temperatures in cables and improvements in insulation effect further savings in copper and lead. Experience in the use of aluminium cables has been satisfactory; improved jointing methods have been devised and the more extensive use of aluminium in low-voltage cables, as well as in overhead lines, is assured.

Progress in the special applications of rectifiers to inverted operation, regeneration, commutatorless motors, d.c. transmission, and so on, was retarded by the years of economic depression, but it is now hinted that important developments are in hand. In particular, the limiting voltage of mercury rectifiers may be further increased, making this apparatus applicable to d.c. transmission. Meanwhile further encouraging results are published concerning the characteristics of the Marx air-blast rectifier.

The developments noted in electrical machinery include constructional improvements in generators for large water turbines; the reduction of vibration in ships by electrical propulsion using synchronous motors with provision for bringing the propeller blades into the most favourable relation; stable test conditions for large d.c. series motors; and sound analysis in squirrel-cage motors for the detection and diagnosis of defects.

Apart from progress in high-speed electric traction under commercial conditions of service, as distinct from specially arranged trials, there have been further additions to the electrified mileage of main line railways in Germany during the past year, and important technical developments are in progress in all branches of electric traction. Those dealt with at the Hamburg meeting included improved tramway controllers, the use of single-phase rectifiers for d.c. traction, and the elastic coupling of traction networks by frequency changers.

Progress in motor control is exemplified by the characteristics of rolling-mill drives while, at the other extreme, synchronous motors continue to gain ground in industrial driving, with considerable economic advantages. Electric-discharge lamps have played an important part in meeting the special requirements of signalling purposes, and in the efficient illumination of the new arterial roads for vision by silhouetting.

Interesting papers in the wireless section of the report deal with improvements in condenser construction by the use of a mineral form of titanium dioxide (rutile) as the basis for a ceramic material of high dielectric constant, the use of Habann valves as ultra-short wave generators, the nature and cause of the "Luxemburg effect," and the results of wireless interference measurements. In the field of communications the problems of heavy and weak current engineering come ever closer together and become more interdependent. Transmission problems and line traffic capacity are of predominant importance in present-day research and practice.

Finally, in the section on measurements, some of the most important problems and developments of to-day are indicated by the papers on extra-high-voltage measurements, the transmission of network measurements, fixed kWh-time meters and other statistical instruments, and high precision instrument transformers.

* "VDE-Fachberichte 1935." Pp. 172; figs. 236. Berlin, V.D.E. Verlag. Price: Rm. 10.20.

Creep-resisting Steel

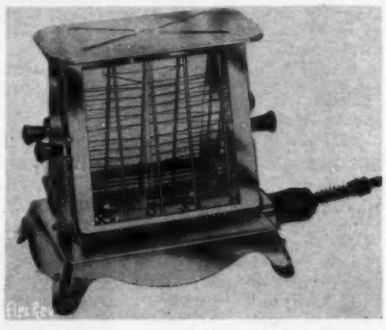
A publication, entitled "Creep-resisting Steel," has been issued by Messrs. Samuel Fox & Co., Ltd. (5s.), relating to investigations carried out, often in co-operation with other bodies, at the central research department of the United Steel Companies, Ltd., in connection with production of "Durehete" steel, which is claimed to be free from temperature-strain-age embrittlement at steam temperatures of from 664 deg. to 932 deg. F. with high pressures. Particulars are given, with diagrams, of tests of all kinds, including the Barr-Budgett method of carrying out accelerated creep tests (to obtain safe working-stress values) over a period of forty-eight hours. A useful appendix is a bibliography, compiled by the Director of the Science Museum, South Kensington, at the request of the company. This is intended to supplement H. J. Tapsell's book, "The Creep of Metals," but it appears to record most of the known literature on the subject from 1930 to 1934, and refers to researches carried out all over the world.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Glass-sided Toaster

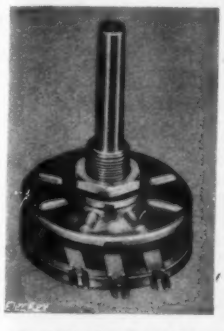
The inside of the rack of ordinary metal toasters is liable in time to corrode, due to steam from the heated bread. To overcome this The HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, Oxford Street, London, W.1, is marketing a turn-over toaster employing glass sides which can be wiped clean with a cloth. The special heat-resisting glass is secured in such a way that it cannot fall out, though expansion is provided for. Other features of this toaster are the insulated knobs for raising and lowering the rack, the non-scratch feet with which it is fitted and the wide top which is designed for keeping toast warm.



The new "Hotpoint" glass-sided toaster

Carbon Potentiometers

"Duplex" carbon potentiometers are the latest development of F. W. LECHNER & Co., LTD., 61, Spencer Street, Clerkenwell, London, E.C.1. They have double contacts and are noiseless in operation; both linear and log law types are available with or without a single- or double-pole switch. The dissipation of the linear type is 1 W and that of the log law 0.5 W. Units with resistances of from 10,000 ohms to 2 megohms are supplied.



A "Duplex" carbon potentiometer

A Small Electric Drill

An inexpensive drill driven by a universal electric motor is being manufactured by MESSRS. FRY'S (LONDON), LTD., 24/25, King Street, Royal Mint Street, London, E.1. All gears are accurately hobbed to ensure long life and enclosed in a strong, grease-tight metal housing incorporating substantial bearings. The mainshaft is fitted with a Hoffmann ball thrust and the keyless chuck has a capacity of ¼ in. The handle is of aluminium die-cast construction, and the loading, using a ¼-in. drill and mild steel, is 175 W.

An "Efesca" Bedlight

A lighting fitting designed primarily for installation between beds, such as in hospitals and nurseries, is manufactured by MESSRS. FALK, STADELMANN & Co., LTD., 83/93, Farringdon Road, London, E.C.1. Made for vertical mounting, it has a cylinder which is only partly glazed and this can be revolved so as to give sufficient light for two beds, or for one only, leaving the other in comparative darkness. With the glazed section turned towards the wall the fitting can be used as a night-light. A 25-W lamp is recommended as the maximum, although the metal-work, which is chromium-plated, is lagged with asbestos.

The bedlight in two positions

Garage Test Bench

The latest test bench offered by ELECTRICAL AND AUTO PRODUCTS (1931), LTD., 280, Deansgate, Manchester, 3, for automobile electrical equipment is designed so that dynamos and magnetos may be tested at various speeds, the universal clamp being capable of holding almost any normal size of dynamo or magneto. The test bench is supplied independently of the switchboard, spark gap, tachometer, coil and condenser tester and rotary spark gap.

The a.c. driving motor is rated at from ½ to 1 h.p. and is of the variable-speed reversible type controlled by a single lever and giving speeds from 50 to 3,500 r.p.m. The switchboard includes a 5-0-25 or 15-0-15 ammeter, independent 6 and 12 V cut-outs, a test lamp with change-over switch and six lampholders.

A Four-circuit Battery Charger

A four-circuit battery charger now available from MESSRS. PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2, is capable of charging a maximum of twelve cells at 3 A on circuit A, and sixty cells at 0.25 A on D. By placing A, B and C in parallel twelve cells can be charged at 6 A. In each case the charging rate is controlled by a rotary tapping switch.

The charger is of conventional external appearance, each circuit being fitted with its own ammeter and switch. The flexible cable is fitted with a two-pin plug.

The Philips charger

Industrial Lighting Fittings

Adjustable fittings for the illumination of lathes, work benches, drills, drawing boards, &c., have recently been redesigned by KANDEM ELECTRICAL, LTD., whose address is 711, Fulham Road, London, S.W.6.

The new "Kandem" bench fitting

In each of the various models the base incorporates a ball joint with adjustable tension so that it can be maintained at any desired angle without becoming "solid" or loose. The fitting is internally wired to a small bakelite terminal box attached to the upright member. The knuckle joint between the two arms is self-supporting and has a small lever to take up future wear occurring in the joint. A further knuckle joint is also fitted near the reflector, and this is provided also with a sideways movement through 180 deg. The reflector projects a beam of 100 deg. The base can be supplied with four-hole fixing or, alternatively, with a clamp. The arms measure 21 in. (vertical) and 12 in. (horizontal). All models are complete with keyswitch lampholders, and angle type reflectors can be supplied by the manufacturers if required.

MEK-ELEK ENGINEERING, LTD., 16, Douglas Street, Westminster, London, S.W.1, has recently developed a new type of adjustable steel fitting for local lighting under industrial conditions. To obviate the difficulty of taking cab-tyre cable through the joints, the jaws are geared and linked together, giving an epicyclic motion through a complete circle. The cable passes the pivot bolts in "S" form so that when the joint is moved the lengthening of the cable round one pivot is always equal to the shortening round the other. The overall length of cable is thus constant, and there is no risk of kinking or of pull on the terminals.

"Mek-Elek" lighting fitting fully extended and folded up

D

The reflector is carried by a head of special design which relieves the lampholder of mechanical stress and protects it and the switch pushbar from accidental blows. The head swivels to throw the light sideways and, as the cable passes through the axis, this motion cannot cause pull on the terminals, while a stop limits twisting to 330 deg. The base is fitted with a connection box which is provided with a removable cover.

This is useful for machine mounting where a three-core cab-tyre cable can be taken from the supply and connected to the two-core cable in the fitting, the third core being brought out to the visible earthing screw. Alternative designs of base for bench, wall or machine mounting are available, and reflectors can be supplied either for 60-W lamps at mains voltage or of a smaller size for 12-V lamps operated off a local transformer.

A Small Industrial Padlock

An industrial padlock for switchgear, &c., is the latest development by MESSRS. J. H. CASTELL, 42, Tavistock Square, London, W.C.1. It is robustly made of brass, and is operated by a key having sunken letters, figures or monogram which correspond with a similar raised design on the lock itself. A master key can also be obtained if it is desired.

The Castell padlock, showing the figure device

A Battery Tool

An interesting tool is being sold in this country by EQUIPMENTS, LTD., 152, Great Portland Street, London, W.1. It is known as the "Seven-in-one battery wrench." In general appearance it is like an ordinary wrench, but it is shaped in such a way that it can be used for removing battery terminal clamps, tightening battery post nuts, as a battery lifter and bolt-hole cleaner, and also as a terminal spreader and cleaner.

A Lightweight Vacuum Cleaner

A new design of vacuum cleaner which is being sold by MESSRS. HOGAN & WARDROP, LTD., 25, Old Street, London, E.C.1, has a cylinder which weighs only 8 lb.; this is covered with cloth finished to give a grey lizard skin effect, the ends being nickel plated. The cleaner is fitted with runners and is sold at a low price. The trade name is "Tireless Tim."

"Tireless Tim"

Lubricating Equipment

TECALEMIT, LTD., Great West Road, Brentford, have introduced an oilcan the spout of which is adjustable to any position and when not in use folds parallel with the barrel. A large cap enables quick and easy filling and the pump is permanently installed in the barrel, thus obviating mess or danger of breakage when charging. The pump plunger is of solid brass, no washers being necessary. A screwed pip is provided on the cap to take the nozzle cover when the can is in use. The capacity is ¼ pint.

New tins of oil in 1, 2 and 4 oz. sizes, have also been introduced. The containers are of pyramid shape and are fitted with special nozzles.

A new "Wall-lite" (Knightshades, Ltd.)

Fractional Horse-power Motors

THE field for fractional horse-power motors has been rapidly enlarged during recent years by the increased use of separate drives in industry and motorised appliances in the home. These usually receive little attention in service and are usually operated by unskilled hands, so that simplicity and reliability are of especial importance.

The "Junior" motors were developed by BULL MOTORS, Ipswich, after over two years' research, during which an analysis was made of the more frequent causes of trouble in small motors. They are now available in a range of from 1/20 to 7/8 b.h.p. in split-phase, capacitor and three-phase types.

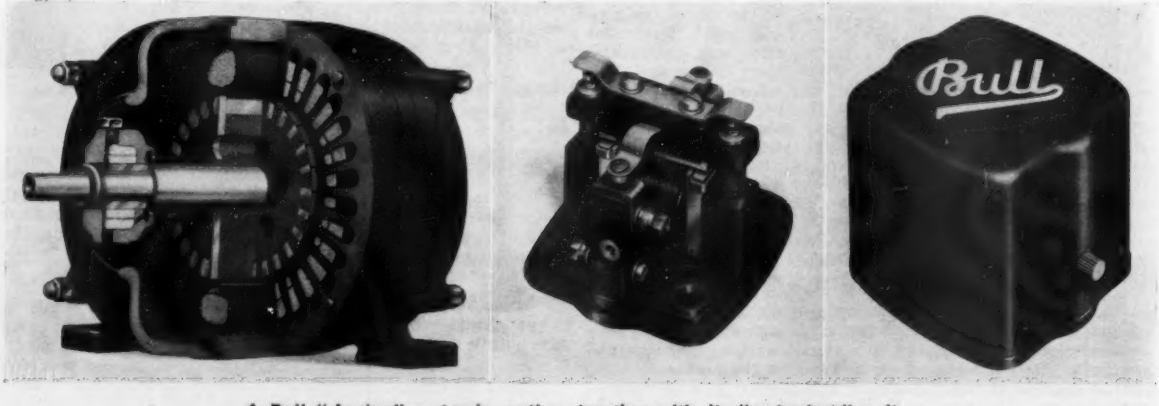
A departure from the general British practice of controlling the starting windings or condensers by an automatic switch, usually operated by centrifugal force and located inside the motor, has been made in the split-phase and capacitor motors. The starting windings and condensers are controlled by the "auto-start" unit which comprises a contactor enclosed in a small bakelite case. The unit automatically adjusts itself to the starting conditions imposed by the load. It can be mounted in any position external to the motor for convenience in inspection and maintenance.

Sleeve bearings are employed to give silent running. Bushes of "Oilite" (an oil impregnated bronze material containing a high percentage of lubricant) are used, and thus all bearing surfaces, including the ends of the bushes, are continuously lubricated. The bushes take up more oil as required from wool-packed oil wells, the addition of a few drops of oil after twelve months' normal running being the only attention necessary. The use of this material for bearing bushes is novel only in its application to fractional horse-power motors.

A separate type of motor is available for driving fans and similar apparatus where the initial starting torque is relatively light. This motor has a condenser permanently in circuit and so needs no automatic switching device. It starts and runs quietly with a relatively high power factor and low starting current, and the only moving part is the squirrel-cage rotor. A standard adaptor ring enables fan motors to be arranged for three-point suspension and the condenser can be accommodated on the frame of the motor, thus forming a compact unit.

For duties involving high starting torque, such as refrigerators, a high-torque capacitor motor is used with an "auto-start" unit. It is claimed that this type of motor can be used in 90 per cent. of those applications for which the repulsion-induction motor was once considered necessary, that it is lower in first cost and maintenance and the elimination of commutator, brush-gear and internal switch mechanism ensures freedom from radio interference.

The windings are mounted on the stator in all types and are jointless, no solder being used in the windings of these motors. It is claimed that the extra cost of the paper-dielectric condensers employed over the electrolytic type is more than justified by increased reliability.



A Bull "Junior" motor in section, together with its "auto-start" unit

In the Courts

AS we briefly reported in our last issue, the Attorney-General (at the relation of the Kent Electric Power Co.) and that company asked on December 11th for an injunction restraining the Gravesend Corporation from supplying electricity to two companies (Cellactite and British Uralite, Ltd., and the Atlas Stone Co.) or otherwise supplying electricity beyond its authorised area.

Mr. Tyldesley Jones, K.C., in opening the case, said that the plaintiffs maintained that the Corporation was supplying an area within the area of supply of the Kent Electric Power Co. The Electricity Commissioners had issued a consent to the Corporation to supply outside its area, but a revocation of that order took effect in October, 1933, and the plaintiffs' case was that notwithstanding this the Corporation had continued to supply the companies named.

The defence was a denial by the Corporation that it had supplied any electrical energy to the two companies named outside its area of supply. It admitted that it had supplied and was still supplying, electrical energy in its area of supply but not otherwise.

When the hearing was continued on December 12th Mr. Tyldesley Jones read the correspondence and pointed out, with regard to the supply to the Atlas Stone Co., that the meter was on a pole inside the Corporation's area, and that the current went into a transformer on the company's works. Dealing with the other company, Counsel said that the cable had been transferred to the company and he (Counsel) contended that that did not affect the control and that the Corporation was still acting in contravention of its Order.

Mr. J. Wood, consulting engineer to the Kent Electric Power Co., gave evidence as to inspecting the sub-stations of the Atlas and the Cellactite Companies. The main cable of the Corporation carried energy at 6,600 V. There were switches on the pole from which the cable led into the Atlas works. Mr. Forsyth, of the Atlas Stone Co., said that his company had an agreement with the Corporation dated March, 1933. The company's sub-station was the property of the Corporation and the company exercised no control over the plant in the sub-station.

Other evidence having been given, Mr. Montgomery, K.C., for the Corporation, said that it had now abandoned its claim to supply the Atlas Co., but the Corporation did claim the right to supply the other company, and alleged that what it was doing was not going outside its legal rights.

At the conclusion of the arguments on December 13th Mr. Justice Bennett, in giving judgment, said that the Corporation was bound not to supply electricity beyond the area specified in its Orders. The works of the Cellactite Co. were near the boundary but outside it. Under an Order of the Electricity Commissioners the Corporation had supplied electricity to the Cellactite Co. in 1929, but the Commissioners had revoked that Order.

The plaintiff company in 1933 was in a position to supply electrical energy to the Cellactite Co. To keep themselves within the area of supply and with the view of not infringing the prohibition against supplying electricity beyond their area of supply the defendants made an agreement in September, 1933, superseding the agreement of 1929 with the Cellactite Co. and undertaking to supply that company with electricity to a point within the defendants' area. It was further stipulated that the company should purchase the cables from that point to its works. The defendants said that they were delivering electrical energy within the area of supply. Further they said: "We deliver our energy at some point approximately at the meter on a pole within our area and that that point is within our boundary." The defendants also said that so long as the delivery ended within their boundary and the consumers agreed to take delivery of their energy within their boundary they were not infringing the statutory prohibition by supplying the company's works.

The plaintiffs on the other hand said that on the true construction of the Acts and the Schedules the defendants had infringed the provisions as they had delivered energy otherwise than at the consumers' terminals and that those terminals must be found to be within the plaintiffs' area of supply. His Lordship said that he was satisfied that on the true construction of the orders the point at which the lines of the Cellactite Co. met the lines the property of the defendants were not the terminals as defined by the Schedule. He came to the conclusion that the terminals of supply for the purposes of the Act meant the supply at the consumers' terminals.

It was perfectly clear that the consumers' terminals here were outside the area of supply of the defendants and that the prohibition had been infringed. It could not be got over by an agreement by which the defendants arranged for the consumers to take delivery of the supply at some other point. On the true interpretation of the Statute the prohibition was infringed when delivery was outside the area of supply. The action therefore succeeded and the plaintiff company was entitled to the injunction which it claimed, with costs. There would also be an inquiry as to damages.

A Wiring Charge Dispute

A charge for wiring made by the North Eastern Electric Supply Co. was criticised at the Hartlepool Sessions on December 11th by the Mayor, Councillor J. B. Graham. The matter arose out of a claim by the company for a small sum for wiring which the defendant, Thomas Smith, denied that he owed. He said that when the wiring was put into the house he was told he would have to pay £5, and he had paid this amount in instalments. Mr. Thomas Martin, the company's collector, produced a paper signed by Smith in which he undertook to pay £13 for the work over a period of ten years.

The Mayor said he considered that the charge was very heavy, whereupon Mr. Martin protested that the court was only considering whether the money (14s. 6d.) was owing. The Mayor replied that the magistrates were there to decide whether the figure was just.

An order was made for a small sum to be paid weekly.

Parliamentary News (BY OUR SPECIAL REPORTER)

ON December 11th a debate took place in the House of Commons on the dispute in the coal industry. Sir Geoffrey Ellis called attention to two other sources of energy which were in competition with coal—oil and electricity. With regard to the latter, it was true that power stations were very big users of coal, but it should not be forgotten that in the last ten years the efficiency of modern boilers and modern grates had been such that they had been able to decrease very largely the amount of coal that they used, and still get a much greater percentage of power. To that extent the increase in efficiency had worked as against the coal producers, but to that extent they ought to remember that the amount of coal that they used no longer bore the same relation to their total costs that it used to bear, and that, therefore, they should be more in a position to consider some amount of higher charge.

Nevertheless, it was fair to point out that anything which increased their expenditure on coal had to be considered by them very carefully, because they had a very heavy dead weight of debt to bear in the form of all the charges that they had to pay and were still paying year by year in order to get a uniform system throughout the whole country; and the very large debt contracted by the Central Electricity Board was also in the end thrown back on the producers of electricity, and finally on the consumers. Consumers could be charged increased prices up to a certain point, and they would pay them, but there came a time when they would say that the increase was too great, and, therefore, they would exercise their brains to the utmost in trying to find some alternative. He believed that it was possible that a good many consumers of electricity would find alternatives, and certain stations might be worked by Diesel engines. That in the end would be worse, because then they would not use any coal at all. Those points must be carefully considered.

Railway Electrification

On December 11th Mr. Chorlton asked the Minister of Transport if he could state the progress made by the railway companies concerned in their investigation of the question of electrifying the railways of South Lancashire and the West Riding of Yorkshire.

Mr. Hore-Belisha said that the railway companies in question had informed him that they were examining the case for electrifying certain lines in the areas referred to, but that their inquiries had not yet reached a stage at which a definite decision could be taken.

Mr. Short asked the Minister of Transport whether, in connection with the schemes guaranteed by the State for the electrification of the railways, he would ensure that railway workers discharged in consequence thereof would receive compensation.

Mr. Hore-Belisha said he understood that in the past railway companies had not had to discharge men as a result of electrification and he saw no reason to suppose that the schemes of electrification which the railway companies now proposed to undertake with a view to improving and increasing services should have such a result.

The Liverpool Street-Chingford Line

Sir Brograve Beauchamp asked the Minister of Transport whether he had now any further information to give in respect to the electrification of the Liverpool Street to Chingford suburban line service; and whether such a scheme was likely to be proceeded with at an early date.

Mr. Hore-Belisha said he had been informed by the London and North-Eastern Railway Co. that as the programme of improvements in passenger transport facilities in the London area, announced last June, was already very extensive and involved as great a burden of expenditure as could be undertaken at present, it would be impracticable to enlarge the schemes so as to include the electrification of the line between Liverpool Street and Chingford. The company had assured him, however, that the situation would receive further consideration when the developments which it had in hand at the present time had made further progress and had become self-supporting.

The Railways (Agreement) Bill

Mr. Neville Chamberlain, the Chancellor of the Exchequer, moved the second reading of this Bill on December 13th. He said that it empowered the Treasury to guarantee the principal and interest on the securities which were to be issued by the finance company to be formed by the Treasury, to enable the main line companies to carry out developments and improvements.

Mr. Alexander, for the Labour Party, criticised the Bill, and urged national ownership as the only solution. He said that the scheme also failed to apprehend the opportunities afforded at present for a real advance in the electrification of our railway services. The Weir Committee estimated the cost of such a project at £261,000,000, and said that it would carry a yield of about 6.7 per cent. If the country could afford to spend £200,000,000 a year on armaments, which was unproductive expenditure, certainly it could find money for railway electrification.

Sir Robert Horne, who followed, said that, in regard to electrification, it was sometimes ignorantly assumed that electricity was fitted to all forms of traffic. As a matter of fact, it was only economical for particular forms of traffic when there was a regular load. If they had only intermittent traffic they could not adopt a more expensive means of transport than electricity. Mr. D. O. Evans, from the Liberal benches, said that the Government was doing something which had the approval of the country. Lord Weir's Committee had reported in favour of electrification, but he (Mr. Evans) feared that the railway stockholders would always be against it.

The Bill was read a second time without a division.

British Overseas Electrical Trade

Excellent November figures

THE curve of Britain's electrical export trade has steepened noticeably in an upward direction during the past four months, as will be seen by the following figures:—August, £1,008,829; September, £1,204,032; October, £1,329,609; and November, £1,411,869. British exports as a whole were slightly less in November than in October (which had one extra working day) and the continued advance of the electrical exports is, therefore, all the more encouraging.

Compared with the corresponding month of last year the value of electrical products shipped overseas was £268,382 (or 23.5 per cent.) higher in November, as will be seen from the accompanying smaller table compiled from figures extracted from the Board of Trade returns. This compares with an increase of £65,801 (or 19.2 per cent.) in imports, which were less in value than in October.

The expansion extended to all the major sections and does not seem to have been caused by any large single consignment; indeed, unenumerated electrical goods at £143,674 (+£22,909), house service meters at £19,283 (+£9,819), and other smaller types of equipment are among the more noteworthy increases. With regard to destinations, it will be seen that the value of shipments to most countries was higher—even to Italy.

Exports of wires and cables, except the telephonic and telegraphic types, attained a new high level at £212,289 (+£27,825), and the following details of destinations are interesting (November, 1934, figures in parentheses):—

Rubber insulated wires and cables.—Australia, £27,106 (£22,754); British India, £20,868 (£16,913); South Africa, £20,627 (£19,547); New Zealand, £8,209 (£6,193); other British countries, £14,198 (£11,787); foreign countries, £9,704 (£10,460).

Electric wires and cables (insulation other than rubber).—South Africa, £41,410 (£29,943); British India, £29,512 (£16,813); Australia, £11,203 (£10,733); other British countries, £17,226 (£15,079); foreign countries, £12,226 (£24,242).

While there was a falling-off in shipments of radio apparatus, the value of telegraph and telephone apparatus exports was nearly twice as much as in November last year. An analysis of the chief destinations, with comparative figures, is as follows:—

Australia, £33,930 (£17,960); South Africa, £32,435 (£17,125); Argentina, £12,637 (£3,410); Canada, £954 (£857); other foreign countries, £58,359 (£30,935); other British countries, £32,557 (£12,953).

Most categories of imports advanced as compared with November, 1934, the increase of £13,813 to £96,438 in radio parts and accessories being outstanding. The values of imports from various sources, with comparative figures, were as follows:—

Electrical goods.—United States, £121,269 (£81,619); Germany, £79,280 (£76,245); Netherlands, £63,590 (£66,432); Switzerland, £18,621 (£14,092); Belgium, £15,324 (£10,627); Austria, £9,487 (£13,744); France, £9,297 (£7,480); other foreign countries, £34,180 (£22,184); British countries, £12,921 (£11,672).

Electric vacuum cleaners.—Canada, £5,883 (£6,544); United States, £5,115 (£1,243); Sweden £3,533 (£4,314); Germany, £986 (£402); other foreign countries, £1,726 (£1,519).

Up to the end of November the total value of British electrical exports was £12,449,904, as compared with £10,156,556 in the corresponding eleven months of last year, representing an increase of £2,293,348. Imports amounted to £3,381,444, as compared with £3,245,728, an increase of £135,716.

EXPORTS AND IMPORTS DURING NOVEMBER

	Exports. Nov., 1935.	Exports. Inc. or dec. compared with Nov., 1934.	Imports. Nov., 1935.	Imports. Inc. or dec. compared with Nov., 1934.
Submarine telegraph and telephone cables	£278	− £9,928	*	—
Telegraph and telephone wires and cables (not submarine)	44,609	+ 6,987	*	—
Other insulated wires and cables	212,289	+ 27,825	£29,214	+ £9,331
Radio receivers, not radiograms (excluding valves)	45,100	− 1,238	35,360	+ 10,789
Radio transmitters (excluding valves)	25,983	− 20,842	*	—
Radio valves	55,536	+ 10,515	25,955	+ 3,966
Other radio parts and accessories	41,487	− 14,833	96,438	+ 13,813
Telegraph and telephone apparatus (other than radio)	170,872	+ 87,632	*	—
Electric carbons	*	—	8,265	+ 782
Incandescent lamps	57,878	+ 7,928	16,351	+ 2,634
Other lighting apparatus	44,291	+ 2,929	48,649	+ 10,374
Primary batteries	18,976	− 317	168	− 435
Accumulators	52,901	+ 6,035	*	—
House service meters	19,283	+ 9,819	*	—
Other electrical instruments	18,625	+ 3,058	30,271	+ 5,162
Unenumerated electrical goods and apparatus	143,674	+ 22,909	73,298	+ 3,458
Electric generators up to 200 kW	28,948	+ 8,117	*	—
Electric generators over 200 kW	72,594	+ 24,935	*	—
Electric motors	102,858	+ 759	17,204†	+ 3,112
Convertors and transformers	90,100	+ 50,375	*	—
Starting and controlling gear for motors	50,293	+ 9,942	*	—
Switchgear	103,871	+ 36,036	*	—
Other electrical machinery	11,423	− 261	10,131	− 437
Electric vacuum cleaners	*	—	17,274	+ 3,252
Total	£1,411,869	+ £268,382	£408,578	+ £65,801

* Not classified separately. † Not railway and tramway motors.

BRITISH ELECTRICAL EXPORTS DURING NOVEMBER

Destination.	Goods and apparatus, Nov., 1935.	Inc. or dec. compared with Nov., 1934.	Electric generators, Nov., 1935.	Inc. or dec. compared with Nov., 1934.	Motors, Nov., 1935.	Inc. or dec. compared with Nov., 1934.	Other electrical machinery, Nov., 1935.	Inc. or dec. compared with Nov., 1934.
Irish Free State	£72,547	+ £19,722	*	—	*	—	*	—
Union of South Africa	158,517	+ 30,066	£21,934	+ £6,412	£29,953	−£10,526	£121,133	+£82,781
British India	122,809	+ 34,179	22,698	+ 12,919	18,570	+ 7,510	43,931	− 6,118
British Malaya	16,553	+ 3,926	*	—	*	—	4,884	− 309
Ceylon	8,136	+ 2,922	*	—	*	—	*	—
Hong Kong	16,041	+ 12,682	*	—	*	—	*	—
Australia	110,238	+ 17,342	5,759	+ 2,147	17,725	+ 8,091	16,212	+ 8,898
New Zealand	45,083	+ 8,296	*	—	4,478	+ 230	10,795	+ 1,111
Canada	7,442	+ 812	14,475	+ 6,528	4,468	+ 107	1,342	− 66
Other British Countries	74,523	+ 4,828	9,588	− 18,819	10,929	− 5,945	13,599	− 258
Sweden	22,175	+ 605	*	—	*	—	*	—
Denmark	8,153	− 122	*	—	*	—	*	—
Belgium	20,297	− 6,164	*	—	*	—	*	—
France	14,197	− 1,310	*	—	*	—	2,340	+ 967
Spain	7,316	− 2,189	*	—	*	—	*	—
Italy	8,530	+ 3,046	*	—	*	—	*	—
Greece	5,540	+ 457	*	—	*	—	*	—
Egypt	8,092	+ 215	*	—	*	—	291	− 1,905
China	34,723	+ 641	*	—	*	—	1,206	− 219
United States	3,034	− 9,208	*	—	*	—	*	—
Argentina	39,582	+ 10,939	*	—	3,472	+ 1,947	3,432	+ 1,900
Soviet Union	*	—	*	—	—	− 1,232	—	− 741
Netherlands	*	—	97	+ 97	*	—	1,012	+ 455
Other Foreign Countries	148,254	+ 6,794	26,991	+ 23,768	13,263	+ 577	35,510	+ 9,596
Total	£951,782	+£138,479	£101,542	+£33,052	£102,858	+ £759	£255,687	+£96,092

* Not classified separately.

New Books

Principles of Mechanism. By F. DYSON. Pp. 323; figs. 161. London: Oxford University Press. Price 12s.

This is a second edition of a work published in 1928 with the object of presenting to students the fundamental principles relating to the moving parts of machines. Its scope is confined to the theory of machines and does not include practical applications, though a knowledge on the part of the reader of elementary applied mechanics is assumed.

There are numerous worked examples in the text, and questions taken from the examination papers of such bodies as London University and the Institutions of Civil and Mechanical Engineers are given at the end of each chapter. The questions appear to be well chosen for assisting those studying for a degree or National Certificate or Diploma or for the membership examination of one of the major engineering institutions.

The call for a new edition without important modifications, except for the addition of sections dealing with viscous friction and controlling force diagrams for governors, indicates that within his self-imposed limits the author has drawn effectively upon his teaching experience.

Messbrücken und Kompensatoren. Vol. I. By J. KRONERT. Pp. 282; figs. 350. Munich: R. Oldenbourg. Price Rm. 13.80.

It will come as a surprise to many electrical engineers to realise that the theory, apparatus and applications of bridge and potentiometer circuits are now so extensive and so important as to justify a two-volume treatment. The fact is that the development of the subject has overtaken its literature, at least as regards a systematic presentation in collected form. Dr. Krönert has, therefore, rendered valuable service in preparing this comprehensive yet concise treatment covering not only the contents of the 325 publications cited in his bibliography, but also including a substantial amount of material not previously published.

The volume now before us deals first with the units and relations of a.c. quantities, the basic principles of mesh circuits, vector diagrams, loci and sensitivity problems. This introductory section is followed by a systematic treatment of the components of d.c. bridges and potentiometers, and the principles and laws of the different circuits available. The construction of apparatus and practical experience in its use form the subject of the second volume now in preparation, but the theoretical treatment in Vol. I covers the important practical considerations of attainable sensitivity and accuracy.

The later sections of the book deal with a.c. bridges and potentiometers in similar manner, including, of course, questions of supply, screening and earthing, and the requirements of component parts. Throughout the book, full attention is paid to deflection as well as null methods and their applications to control purposes. The use of bridge circuits in automatic combustion control is a case in point. This book may be recommended confidently to students, research workers and practical engineers alike.

Technical and Scientific Encyclopædia (Four volumes). London: Hutchinson & Co. Price £5.

The four volumes of this work are the completed forms of a previously issued series of parts. The scope is extremely wide and claims to run almost the whole gamut of technical and scientific terms. An unusually large amount of information has been gathered together, dealing with all well-known scientific and engineering subjects. The chief tenor of the work is that of general definition; consequently, the most direct appeal is visualised as lying with reference libraries of all types, where the key to research into definite channels may be found in the definition in this encyclopædia.

The electrical items are generally well done, within the limits prescribed, but they do not, naturally ,take price of place in the work. They are of a type that would appeal chiefly to students seeking new or added definitions. The list of terms —arranged alphabetically throughout—is fairly complete and up to date; thus the Baud is well defined, although newer electrical terms, such as electron-volt, positron and deuretron are not included.

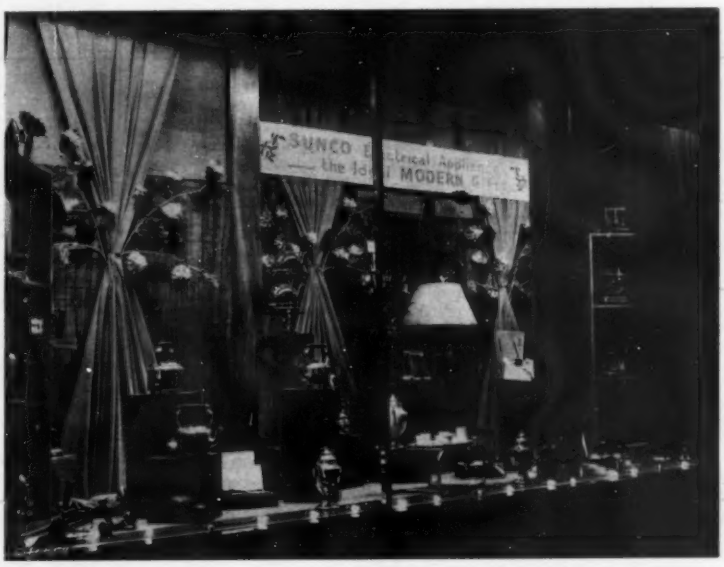
There is evidence of slight partiality to certain sections. For example, organic chemistry is particularly well done and structure diagrams abound. Glass covers twenty-two pages, whereas "Electric" and "Electricity" are given over fifty-nine pages of legitimate text. On the other hand, the organic substance "Coccin," is dismissed as being a red dye. The reader is thus left with the impression that the depth of treatment is often slightly uneven.

The standard of illustration is high and the diagrams are clearly rendered, but several pages of valuable space are occupied with photographic illustrations that would have been more usefully occupied with text. The tabulated facts and data are, however, well done and, in many cases, might save a long search for a busy data seeker, while the bibliography at the end of Vol. 4 is a valuable feature. Accordingly, the work should be welcome wherever access to a wide variety of technical and scientific data is required.

Relay Systems. By I. T. MONSETH and P. H. ROBINSON. Pp. 549; figs. London: McGraw Hill Publishing Co., Ltd. Price 36s.

Most relay engineers in this country will have studied the excellent series of articles on relay systems which were recently contributed by the present authors to *Electric Journal*. The substance of these articles has now been expanded into a treatise which gives a comprehensive account of the theory of automatic protection and of American practice in this field.

Nearly one-half of the book is devoted to an explanation of the theory of symmetrical components and to the calculation of circuit constants and fault currents. The technique of automatic protection is dealt with in four main chapters on differential systems of protection, short-circuit and earth-fault protection by parallel-feeder and impedance-relay systems, pilot systems of protection, and high-speed relaying. For the benefit of students there is a short chapter on vectors and their application to relay problems. There is an interesting theoretical discussion of the effect of distorted current-wave form on relay performance The chapters on the performance of relay transformers and on testing and maintenance, while being interesting, are relatively superficial in character, although the discussion of the characteristics of capacitance devices for relay voltage excitation is worthy of note.



One of the Sun Electrical Co.'s windows in Charing Cross Road, W.C.2, in which a representative array of electrical Christmas gifts has been set out

The scope of the book appears to be strictly limited to American practice, and there is no reference to methods of protection which have been developed and used elsewhere. Apart from this limitation, the work is to be commended as a penetrating study of the fundamental problems of automatic protection that will fill a niche in the literature of this subject which was hitherto vacant. The general bias is, however, somewhat theoretical; had the practical side of the subject been slightly more stressed, the appeal of the book might have been wider.

"Handbook of the Radio Direction Finder." Commdr. F. G. LORING. Pp. 24. London: The International Marine Radio Co., Ltd. 2s.

This is a book of instructions for the use of the direction finder as a navigational instrument rather than as part of the wireless telegraph installation. In addition to a description of the instrument with notes on its properties, reliability and errors, information is given relating to calibration and on taking a bearing. The left-hand pages are left free for notes.

* * *

Shorter Notices

The third edition of "The Theory of Machines," by Louis Toft and A. T. J. Kersey (Pitmans, 12s. 6d.), has just been issued. It was originally written to cover the syllabuses of the universities, and many new examples have been included and the treatment of lubrication has been extended. To the last chapter has been added some notes on the general case of a light loaded shaft and on torsional oscillations.

"Television Up to Date," by R. W. Hutchinson. Pp. 184; figs. 125. London: Universal Tutorial Press, Ltd. Price 2s. 6d.

"Foundations of Short Wave Therapy," by Wolfgang Holzer and Eugen Weissenberg. Pp. 228; illus. 53. London: Hutchinson & Co. (Publishers), Ltd. Price 12s. 6d.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The Glasgow Plant Contracts

At its meeting on December 12th Glasgow Corporation decided to place a contract for two 50,000-kW steam turbo-alternators, complete with condensing plant for Dalmarnock power station with Messrs. C. A. Parsons & Co., Ltd. The value of the contract is £353,770. As we reported in our issue of December 6th, the Corporation at its last meeting deferred consideration of the recommendation of the Electricity Committee to place the contract with Messrs. Parsons, pending consideration by members of the Council of a report on the various tenders. At last week's meeting a letter was read from Whiteinch Ward Committee protesting against the recommendation of the Electricity Committee and pointing out that the employés of the General Electric Co., Ltd., which was also among the tenderers, numbered 33,000, and that 260 of these were employed in Glasgow. It was emphasised in the letter that the General Electric Co. were ratepayers in Glasgow. A communication was also read from Richardsons-Westgarth-Brown-Boveri, Ltd., who pointed out that their price for the plant was £40,000 lower than Messrs. Parsons's and £14,000 less than the second lowest offer received. Mr. T. D. Galbraith moved an amendment that all the tenders be submitted to the Central Electricity Board with a request that they be carefully scrutinised, and, having taken into consideration efficiency and cost, placed in order of merit. Opinion which he had received from people in the engineering and electrical industries was practically unanimous that each of the seven companies which had tendered for the contract was quite capable of undertaking the work which was required. If that was so, one's first inclination would be to accept the lowest offer, but there were also questions of running expenses and reliability to be considered. He therefore thought it would be to the benefit of the Corporation if it could get independent technical guidance on the matter. Mr. J. McSkimming seconded, and Bailie Mrs. Jean Roberts supported the recommendation of the Electricity Committee.

Mr. W. Brownhill Smith said each of the tenderers was a firm of standing and reputation. Mr. A. Munro, convener of the Electricity Committee, supported the recommendation of the Committee. On a division it was decided by fifty-six votes to thirty-two that the contract should be given to Messrs. Parsons. Five members declined to vote.

At the same meeting of the Corporation the recommendation of the Transport Committee that a contract for the supply of trolley wire should go to Messrs. W. F. Dennis & Co., representing Felten and Guilleaume, Germany, was rejected and an amendment was carried by thirty-two votes to twenty-five that the contract should be divided between the two lowest British tenderers. The difference in cost represented only 10 per cent.

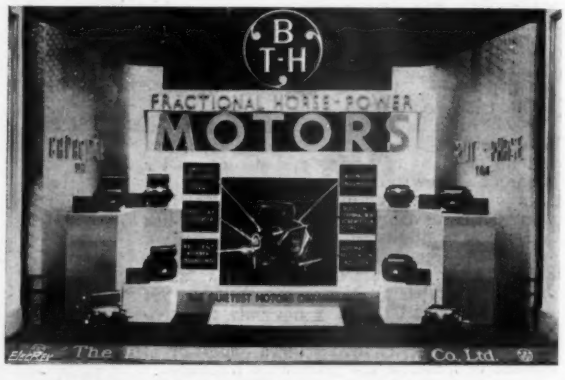
The Lighting of a Melbourne Restaurant

The lighting of the dining-room of Messrs. Manton & Sons Pty., Ltd., Melbourne, Australia, offered many problems. The dining-room was built as an extra floor to the existing store and the architects and lighting designers, Messrs. Brooks Robinson Pty., Ltd., had practically a free hand in submitting a modern scheme. The one finally approved by the architects consisted of lighting the tops of the columns and also fixing lights to the daylight wells. This was done by building metal supports into the fabric and fixing to the supports segments of quarter-inch sandblasted, bevelled and coloured plate glass. The lighting of the columns is by means of a shaped plastic trough around the bottom of the ornamental plates, and as the top of the column is mushroom headed the light is evenly distributed back through the various glass plates. The construction of the lighting fixture in the daylight well also called for great care in designing, so that during the day the wiring conduits and reflectors are not seen through the lightly sandblasted glass.

The dining-room of Messrs. Manton & Sons Pty., Ltd., Melbourne

A Display of Small Motors

An effective window display has been arranged at the London offices of the British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C., where examples from the company's range of fractional h.p. motors are being shown on an illuminated cut-out photographic enlargement of a capacitor motor with resilient mounting and automatic belt-tension device. Attention is drawn to the drip-proof end shields, infrequency of attention for oiling, end-play silencer, built-in terminal box which is screwed for conduit and fitted with knock-out; resilient rubber mounting, and automatic belt-tension adjuster. The display is carried out in black, red and silver, with the slogan "The quietest motors obtainable."



A display of B.T.H. small motors at Crown House

Irish Free State Electrical Imports

There was a slightly quieter tone in the electrical trade in the Irish Free State during October last, the imports of electrical machinery and cognate material attaining a value during the month of only £113,075 as compared with £131,691 in October, 1934. The appended table shows the imports during the first ten months of this year and 1934:—

	January-October. 1934.	1935.
	£	£
Electric motors	38,829	38,513
Other electrical machinery	224,372	165,166
Dry batteries and parts	23,838	27,532
Electric lamp bulbs	50,114	57,535
Electric lighting accessories, fittings and parts	42,010	65,882
Electric wires and cables, insulated	75,392	78,383
Telegraph and telephone apparatus	9,809	12,578
Radio receivers, complete	74,677	89,692
Radio-gramophones, complete	6,069	5,220
Other radio apparatus, fully or partly assembled	8,841	5,126
Radio parts and accessories	71,470	65,950
Other electrical goods and apparatus	157,793	224,160
Totals	£783,214	£835,737

As will be seen, all but five items of the table show an increase, which for the ten months amounts in the aggregate to £52,523.

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for registration were accepted:—

Pitts, T. F., Laisterdyke, Bradford.
Beacon Electrical Co., Stockport.
Bird, A. E., Beckenham.
Westray, H., Longsight, Manchester.
Lomax & Samways, Ltd., Stockport.
Goddard, A. W., & Son, Highgate, London, N.6.
Roberts & Jowett, Lidget Green, Bradford.
Ames, F. W., Bognor Regis.
Todd, W., Edinburgh.
Newman, A. S., Uxbridge.

Australian Duty on Electric Hair Dryers

At the resumed inquiry by the Australian Tariff Board into the duty on electric hair dryers, Mr. B. H. Keogh, manager of the Electrical Engineering and Construction Co., Pty., Ltd., supported the request for a duty on the pedestal type. He said that owing to continued reductions in the retail prices of imported hair dryers discounts made by his company had been reduced, with the result that the volume of sales had

been affected. Mr. E. H. W. Westwood, managing director of McColl Electric Works, Pty., Ltd., said his company had developed an electric motor to suit Australian conditions of standard versus non-standard voltages. Foreign firms continued to import and sell machines which did not always comply with requirements. A considerable number of imported motors were coming into Australia, notably from Germany, America, Japan and Italy. He asked the Board to consider favourably a British preferential duty of 45 per cent. and a general duty of 65 per cent. Mr. J. Wren, manager of the Marigny Laboratories, Pty., Ltd., said there had been a considerable drop in the sales of his firm's product owing to the reduction in the price of a machine manufactured in England.

A Restaurant Lighting Installation

An interesting restaurant lighting installation has recently been completed at the premises of Messrs. Stagg & Russell,

The restaurant of Messrs. Stagg & Russell, Ltd., illuminated by means of Siemens architectural lamps

Ltd., Leicester Square, W.C. Siemens architectural lamps and fittings were used, the circles, half circles and quarter circles of light, forming a decorative motif which provides evenly diffused illumination. An additional feature of the installation is the use of Siemens 200-watt lamps, bowl-sprayed yellow, which are placed above the ceiling lay-lights. The scheme was carried out by the electrical staff of Messrs. Stagg & Russell, under the direction of Mr. A. W. Jervis, the chief engineer.

Trolley-bus Contracts

The London Passenger Transport Board has placed contracts for 270 more trolley-buses. These vehicles are for service in North and East London on routes included in the scheme for the conversion of tramways to trolley-bus operation for which Parliamentary sanction has been obtained. The total number of trolley-buses ordered to date in connection with this conversion scheme is 690; over 100 of these are already in operation. The new contracts have been placed with the following: Leyland Motors, Ltd. (170 chassis); Associated Equipment Co., Ltd. (100 chassis); Birmingham Railway Carriage & Wagon Co., Ltd. (70 bodies); Metropolitan-Cammell-Weymann Motor Bodies, Ltd. (124 bodies); Brush Electrical Engineering Co., Ltd. (50 bodies); Park Royal Coachworks, Ltd. (25 bodies); Associated Manufacturers of Electrical Traction Equipment, Ltd. (270 sets of electrical equipment).

A Lighting Jubilee at Taunton

Taunton claims to have been the first town in England to have its streets "permanently and successfully" illuminated by electricity and the golden jubilee of the system was celebrated at a dinner of the staff of the Electricity Department held on December 19th at the County Hotel. The guest of honour was Mr. H. G. Massingham, of Brighton. Mr. A. J. Howard, the borough electrical engineer, presided, and among others present were the Mayor and Mayoress, Ald. and Mrs. J. C. Lane, Mrs. Massingham, Messrs. A. C. Cramb (E.D.A.), E. J. Dowson (E.D.A.), J. W. H. T. Legge (manager, S.W. England, C.E.B.), A. J. Newman (Bristol), R. W. L. Phillips (Bedford), W. F. Long (Bath), A. L. Keet (Exeter), R. R. Hodge (Metro-Vick., Bristol), E. W. Tole (North Somerset Supply Co.), and H. F. G. Woods (Exe Valley Co.).

Mr. Howard submitted the toast of "The Guest of Honour," extending a welcome to Mr. Massingham, and Mr. Massingham, who was the original owner of the Bath and the Taunton electric light works and former managing director of the Exeter Electric Light Co., Ltd., in reply told how in the summer of 1880 he gave a practical demonstration of electric lighting in Taunton by organising an open-air concert. In 1884, with the sanction of the Taunton Corporation, he gave an exhibition of public street lighting, with Thomson-Houston arc lamps of 1,200 c.p. each. The following year the Corporation advertised for tenders for lighting a small central area, and his was the only one received and accepted. On December 12th, 1885, the public street lighting, also private, was commenced. Other places tried public street lighting by electricity before Taunton, but they were not successful: there was a break in the continuity, notably London, where it was tried on a large scale. He also organised a small electrical exhibition in Taunton, at which practical demonstrations were given of the many uses to which electricity could be applied. At the invitation of Exeter citizens who visited Taunton, he undertook the introduction of electricity into that city.

Mr. A. C. Cramb, in proposing "The Electricity Department," said that the Taunton undertaking had made rapid progress. Starting with twelve consumers it now had 6,500, and during the last five years the load had doubled. No section of the community more highly appreciated the uses of electricity than those with small incomes. Rural dwellers were also anxious to share the advantages of electricity, but owing to the fact that farms and houses were so scattered the cost involved was very considerable. Supply undertakings were rather unfairly accused of a lack of progressive spirit in that direction, but neither corporations nor companies could spend large sums of money in laying mains which would not ensure something like a reasonable return. In the West of England generally there was a gratifying development of supplies in country districts.

Councillor F. W. Pritchett Brown, replying, spoke of the flourishing condition of Taunton's Electricity Department and mentioned that it had made a substantial contribution annually for several years past towards rate relief. Tributes were paid to the successful work of Mr. Howard, the borough electrical engineer, and his staff.

In *The Times* of December 16th there appeared a letter from Mr. H. M. Sayers referring to a report of the Taunton celebrations and suggesting that Eastbourne was the first town to light its streets electrically. Mr. Sayers was engineer to the Eastbourne Electric Light Co. He also says he is inclined to think that the City of London has an even better claim in this respect since a section of street lighting was carried out in 1880.

The Electricity Supply Rifle League

The annual dinner and prize distribution of the Electricity Supply Rifle League was held on December 7th at Maison Lyons, Shaftesbury Avenue, London, under the chairmanship of the president, Mr. J. R. J. Bowden, of Hackney, who was supported by Messrs. W. Weekes, borough electrical engineer, Shoreditch, H. P. Gaze, of the London Power Co., R. S. Downe, of the Brompton & Kensington Co., G. Weston, of the Kensington & Knightsbridge Co., R. H. Mace, of the St. James' and Pall Mall Co., S. G. Nodes, of the London Power Co. (Grove Road), M. Farrer, of Twickenham (J.E.A.), and P. C. Ebner, of Shoreditch. Speeches are only of short duration on these occasions, and they consisted of the toast of the Chairman, by Mr. Gaze, and a reply by Mr. Bowden. A vote of thanks to the dinner committee by Mr. Weekes was responded to by the hon. secretary, who had previously given a brief résumé of the year, pointing out that an effort should be made to celebrate the silver jubilee of the League next year by increasing the number of teams competing and, if possible, to start a new competition. The leaders of the various divisions after the final shoots for 1935 are as follows:— Division 1: Shoreditch "A." Division 2: Barking. Division 3: K. & K. Division 4: Lewisham "A."

Electrical Wholesalers' Dinner

The Electrical Wholesalers' Federation is holding its annual dinner on March 5th next at the Savoy Hotel, London, W.C.

Social Events

On December 14th an interesting dinner took place at the St. Stephen's Club, for the purpose of a re-union of members of the staff of the Folkestone Electricity Supply Co., Ltd., who used to work together nearly thirty years ago. Mr. J. L. Eve, who organised the function, gathered together a muster of seventeen. There are still about ten members whom he was unable to trace who are asked to communicate with him at 272, Vauxhall Bridge Road, Victoria, S.W.1, so that he may include their names in the invitation for the next dinner. It has been decided to make the function an annual event. Mr. Hesketh, who was chief engineer in those days, was unable to be present to take the chair. It was agreed to keep the chair vacant for him and it was taken by proxy by Mr. J. L. Eve. Those present at the dinner were: Messrs. J. L. Eve, A. G. Mills, S. Potter, V. Graff, H. Joseph, W. J. Foad, E. R. Crockley, A. H. Jenkins, H. A. Duckett, J. Aspin, T. Keeler, A. Goodenough, Bernard Inge, A. C. Evans, F. H. Bushell, P. V. Gurr and H. A. Klein.

Standard Switchgear Ltd. held its first works and staff dinner on December 13th at the Golden Lion Hotel, Romford. There was a large assembly and during the course of the evening Mr. A. G. Collis, governing director, outlined the progress of the company, mentioning that their designs were penetrating to all parts of the world. He thanked the shop and staff for their loyalty and co-operation, and referred to important future activities.

Scottish Display in London

Several Scottish manufacturers of electrical goods have already booked space in the first of three displays of Scottish products to be staged in the special Scottish section at British Industries House early in the New Year. The displays are

being arranged by a committee presided over by the Earl of Elgin and including Lord William Scott, M.P., Mr. J. Henderson Stewart, M.P., Mr. Thomas Hunter, M.P., Mrs. Walter Elliot, Sir William Goodchild, Assistant Commissioner for the Special Areas and Sir Alexander Swan, LL.D. The exhibition will run for a month.

Orders Recently Booked

Messrs. Ruston & Hornsby, Ltd., have received orders from film studios for oil engines totalling nearly 3,000 b.h.p. These are for one 600 b.h.p. and one 450 b.h.p. engine, for Messrs. Warner Bros., First National Productions, Ltd., Teddington, and a repeat order for four 440 b.h.p. oil engines for a new film studio which is being built by Sound City, Ltd., Shepperton.

A continued increase in the number of export orders for electrical plant is reported by Lancashire Dynamo & Crypto, Ltd. Recent orders include a complete electrical equipment for Tindals Gold Mines, Ltd., covering two 260-kVA engine-driven alternators (3,300 V, 50-cycle, 3-phase), and four motors for compressor drives, together with the necessary main switchboard, control gear and transmission lines. This equipment is a duplicate of that on order for the Paget Gold Mines of Edjudina, Ltd. The South African Railways and Harbour Board has also ordered twenty-six crane equipments, each consisting of four motors. These equipments are for Capetown and Port Elizabeth, the main hoisting motors being of 60 b.h.p. In the home market several orders have recently been received for the Lancashire-Crypto patent electric planer drive, each equipment consisting of six motors.

Space Heating, Ltd., 46, Park Square, Leeds, 1, has recently obtained the contract for designing and supplying complete electric heating equipment for the electricity showrooms, offices, &c., of Exeter Corporation.

The General Electric Co., Ltd., has received orders for electric lighting fittings for the following cinemas :—Cranston's, Renfield Street, Glasgow; Embassy Cinema, Shawlands, Glasgow; Calton Cinema, Edinburgh; Rothesay Cinema, Rothesay. These fittings represent the latest practice in cinema illumination and will be installed by the various contractors associated with the equipment of these theatres.

German Electrical Imports and Exports

According to a table published in a recent issue of *E.T.Z.* the imports of electrical machinery and cognate material into Germany during the nine months ending with September last attained a value, converting Reichmarks at 12.25 to the £, of £1,323,510 as compared with £1,583,755 in the corresponding nine months of 1934. On the other hand there was an increase in the exports of similar material from Germany during the same period from £13,099,918 to £13,627,510.

New " Nesco " Branch Showrooms

The North Eastern Electric Supply Co., Ltd., has opened new showrooms at Billingham-on-Tees which comprise a spacious display room with facilities for cooking demonstrations, modern offices, workshop and garage. The opening ceremony was recently performed by Councillor E. Welsh, chairman of the Billingham Urban District Council. The guests were invited to tea in the North Tees power station Recreation Club, at which Mr. W. F. T. Pinkney presided and presented an electric coffee service to Councillor Welsh.

For Sale

The Cambridge Electric Supply Co., Ltd., has for sale one reversible frequency changer, 1,250-kVA alternators, switchboard panels, &c.

(See our classified advertisements.)

The Cantieny High-pressure Boiler

International Combustion, Ltd., informs us that it has obtained a licence from the patentees for the manufacture and sale of the Cantieny high-pressure boiler. The licence covers this country and the British Empire. As distinct from some other recent developments in high-pressure boiler design, the Cantieny boiler works under natural circulation without exterior aids. It has already been built for capacities up to 260,000 lb. per hour evaporation at a pressure of 1,917 lb. per sq. in. The boiler may be fired by any known method, and the design is readily adaptable to meet the requirements of any type of fuel or output.

The " Coolicon " Gift Scheme

The Benjamin Electric, Ltd., informs us that under its " Coolicon " gift scheme, organised earlier in the year, a gold watch has been presented to Messrs. G. Hopkins & Sons (Clerkenwell), Ltd., the retailers of the 250,000th " Coolicon " lighting fitting. The wholesaler who sold this " Coolicon " not having notified the company, the gold watch awarded to wholesalers has been allocated to the General Electric Co., Ltd., which disposed of " Coolicon " No. 249,999. In addition, fountain pens have been sent to those selling the last 100 " Coolicons."

Electric Locomotives for New Zealand

A *Reuter* message from Wellington (N.Z.) states that eight electric locomotives have been ordered by the Government Railways from the English Electric Co., Ltd. They are for use on the Wellington-Paekakariki section of the main trunk line which is now being electrified. The locomotives will be streamlined, and are to haul freight loads of 500 tons.

Christmas Holidays

The London offices of the Jackson Electric Stove Co., Ltd., will be closed on Tuesday evening next until Monday morning, December 30th.

Messrs. C. H. Parsons, Ltd., are closing their offices and works from mid-day, December 24th to December 30th.

Trade Announcements

Messrs. J. G. Statter & Co., Ltd., are removing to-morrow (Saturday) to 82, Victoria Street, S.W.1.

Mr. G. M. Brewster, electrical engineer, has removed to 19, Lindsay Avenue, Levenshulme, Manchester. The telephone number remains unchanged.

Messrs. Cooper & Smith are removing on December 23rd to 94, Charlotte Street, W.1, where they will display their " Heley " series of electric lighting fittings.

The telephone number of the Charlton Works of Messrs. Johnson & Phillips, Ltd., has been changed to Greenwich 3244-3253.

Calendars and Diaries

The Hart Accumulator Co., Ltd., has again sent us one of its useful desk blotters.

" Shirley " is the title of the artistic calendar received from Mr. Christopher Wade, of Gabriel Wade & English, Ltd., which has an auburn-haired beauty for its subject.

The diary of the Association of Engineering and Shipbuilding Draughtsmen is bound in dark green leatherette, and as in previous years contains a vast amount of technical information which has been brought up to date.

A colourful picture of old London Bridge has been chosen by Wiring, Ltd., for its calendar which has monthly slips.

The diary received from the London Electric Supply Corporation, Ltd., is neatly bound in brown leatherette, and has a section for notes with an alphabetical thumb-index.

Messrs. Landis & Gyr, Ltd., have sent us a refill for their desk calendar.

The large monthly sheets which form the calendar of Messrs. C. A. Parsons & Co., Ltd., bear illustrations of the various processes employed in producing some of the company's electrical plant.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price, December 17th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... „	£18 10s.	—
a Borax ... ... „	£17	—
a Copper, Sulphate ... ... „	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a „ Perchlorate ... ... „	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a „ Roll ... ... „	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a „ Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b „ Wire ... ... per lb.	1/1 to 1/9	—
b „ Sheet and Foil... ... ... „	1/2 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£205	—
Grade II... ... ... „	£141	—
Grade III ... ... „	£74	—
c Brass (rolled metal 2" to 12" basis)... per lb.	7¾d.	—
c „ Tubes (solid drawn) ... ... „	9¼d. to 10d.	—
c „ Wire, basis ... ... „	7¾d.	—
c Copper Tubes (solid-drawn) ... „	10¼d.	—
g „ Bars (best selected)... ... per ton	£66	—
g „ Sheet ... ... „		
g „ Rod ... ... „		
d „ (Electrolytic) Bars ... ... „	£39 10s.	10s. dec.
d „ „ Wire Rods ... „	£45 10s.	10s. inc.
d „ „ H.C. Wire ... per lb.	7 5/8d.	5/8d. inc.
f Ebonite Rod ... ... „	1/6 to 2/– plus	—
f „ Sheet ... ... „	1/3 to 1/6 10%	—
n German Silver Wire ... ... „	2/5	—
h Gutta-percha, fine ... ... „	nom.	—
h India-rubber, Para-fine ... ... „	6¾d.	¼d. inc.
i Iron, Pig, (Cleveland No. 3) ... per ton	67/6	—
i „ Wire galv. No. 1, P.O. Qual.... „	£20	—
g Lead, English Pig ... ... „	£18 15s.	£1 dec.
g Mercury ... ... per bot.	£12/7/6 to £12/17/6	7s. 6d. inc.
c Mica (in original cases) small ... per lb.	6d. to 1/–	—
c „ „ medium ... „	5/– to 10/–	—
c „ „ large ... „	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... „	1/1	—
p „ „ drawn bars & rods „	11¼d.	—
p „ „ rolled strip & sheet „	11¼d.	—
p „ „ wire ... ... „	1/0½	—
o Platinum ... ... per oz.	£7 17s. 6d.	—
d Silicium Bronze Wire ... ... per lb.	8¼d.	¼d. dec.
g Spelter ... ... per ton	£14 17s. 6d.	16s. 3d. dec.
r Steel, Magnet, in bars ... ... per lb.	7¾d.	—
g Tin, Block (English) ... ... per ton	£221 5s.	£1 15s. dec.
m „ Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.
g Henry Gardiner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
m P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our " Business Notes " under the same heading.

New Catalogues and Lists

British Thomson-Houston Co., Ltd., Rugby.—A leaflet dealing with the "Mazda" sun lamp.

H. Wallwork & Co. (1920), Ltd., Red Bank, Manchester.—Pamphlets describing worm-reduction gear and a patent universal lamp bracket.

Chloride Electrical Storage Co., Ltd., Exide Works, Clifton Junction, Manchester.—A booklet dealing with "Exide" batteries for emergency lighting in cinemas.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1.—Particulars of the company's folding trestles.

Higgs Motors, Ltd., Birmingham, 6.—A leaflet on motorised gear units up to 10 b.h.p.

Ferguson, Pailin, Ltd., Higher Openshaw, Manchester, 11.—Catalogue sections describing flat-back type switchboards and moulded stone cellular gear.

Bankruptcy Proceedings

D. A. Bolton, electrical contractor, 4, Palace Chambers, Bridge Street, London, S.W., and Reigate Road, Ewell.—The statutory first meeting of creditors under this failure was held on Tuesday at London Bankruptcy Buildings, when accounts were lodged showing total liabilities of £367 (ranking £252) and assets £23. The debtor states that he began business in January, 1931, with £50 capital, having obtained a contract to wire new houses then being erected on an estate at Ewell. The failure is attributed to competition and loss on unremunerative contracts. The case was left in the hands of the Official Receiver.

N. Ellis, Station Road, Oxenhope, Yorkshire, and 20, New Road, Denholme, Yorkshire, trading as "Oxenhope Radio Stores," wireless dealer.—The first meeting of the creditors of the above was held on December 10th at the Official Receiver's office, Hallfield Chambers, 71, Manningham Lane, Bradford. The debtor's statement of affairs showed gross liabilities of £347, of which £332 was expected to rank for dividend, with a deficiency of £294. He attributed his failure to insufficient turnover and lack of experience. The case being a summary one was left in the hands of the Official Receiver as trustee.

L. Marson, electrical contractor, 81, Norwood Road, Herne Hill.—The first meeting of creditors was held on December 11th at London Bankruptcy Buildings. The debtor petitioned the Court on November 30th with liabilities of £392 against assets of £98. He stated that he started business on his own account at the above address in March, 1932, and that his failure was caused by loss sustained on contracts and insufficiency of profits to meet overhead and living expenses. The case was left in the hands of the Official Receiver.

Sanders Electric & Radio Service & Supplies, radio dealers, 231, Staines Road, Hounslow.—Receiving order made December 6th on a creditor's petition.

D. S. Williams, electrical engineer and contractor, 342, Dewsbury Road, Leeds.—Receiving order made December 6th on debtor's own petition.

W. Howson (Maxivox Radio Service Co.), 7, Olton Street, Wavertree, Liverpool.—Receiving order made December 6th on debtor's own petition. First meeting December 20th and public examination February 4th, both at Government Buildings, Victoria Street, Liverpool.

C. E. Keats, electrical and mechanical engineer, 110, Brent Street, Hendon, N.W.—Discharge suspended for six months until May 14th, 1936.

S. G. Penrith, electrical contractor, 60, Mount Pleasant, Barrow-in-Furness.—Last day for receiving proofs for dividend December 24th. Trustee, Mr. W. G. Pearson, 16, Cornwallis Street, Barrow-in-Furness, Official Receiver.

J. Carson, radio dealer, 38, Clerkenwell Green, E.C.—The public examination of this debtor was held and concluded at the London Bankruptcy Court on December 13th, the accounts showing total liabilities of £895 (unsecured £636) and assets of £57. In reply to the Official Receiver the debtor said he began business in wireless sets in August, 1934. Most of the goods were sold under hire-purchase agreements and he attributed his insolvency to the default of hirers.

F. Adams and **R. Barlow** (Adams & Barlow), electricians, 11, Station Parade, Wanstead, London.—Trustee, Mr. E. Parke, Bankruptcy Buildings, Carey Street, W.C., released December 4th.

J. Cameroff (J. Cameron), electrical engineer, 43, Camp Road, Leeds.—Last day for receiving proofs for dividend, December 30th. Trustee, Mr. H. C. Bowling, 24, Bond Street, Leeds, Official Receiver.

A. D. M. Mayer, electrical engineer and wireless specialist, 75, Pasture Road, Goole.—First and final dividend of 5s. 5d. in the £1, payable December 27th at 27, York Street, Sheffield.

Company Liquidations

Radio Components, Ltd., 527-533, Harrow Road, London, W.—Under the compulsory liquidation accounts have been lodged showing total liabilities of £5,255, made up of unsecured debts £4,421, preferential claims £80, and debenture loan £690; the assets are valued at £165 after providing for payment of the preferential and debenture claims; the issued capital is returned at £600, and the total deficiency is estimated at £4,918. Mr. H. P. Naunton, Senior Assistant Official Receiver, reports that the winding-up order was made last January on the petition of Mr. Theodor Kolb, the managing director, who is a creditor for over £2,000 for cash advanced. The company was formed as a private company in August, 1933, to carry on business as manufacturers of coils for wireless sets. A receiver for the debenture holder was appointed on December 20th, 1934. He has now nearly completed his receivership and there will be no surplus for the unsecured creditors. Mr. M. G. Hacker, 329, High Holborn, W.C., has been appointed liquidator.

McWhirter & Sons, Ltd.—Winding up voluntarily. Liquidator, Mr. P. A. Hayes, 12, Pembroke Terrace, Cardiff. Particulars of claims to the liquidator by December 31st.

Warners Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. H. Rainsbury, 20-21, Broad Street Avenue, E.C.

Warners Electrical Trust, Ltd.—Winding up voluntarily. Liquidator, Mr. H. Rainsbury, 20-21, Broad Street Avenue, E.C.

Gilbert's Electrical, Ltd.—Winding up voluntarily. Liquidator, Mr. P. A. Hayes, 12, Pembroke Terrace, Cardiff. Particulars of claims to the liquidator by December 31st.

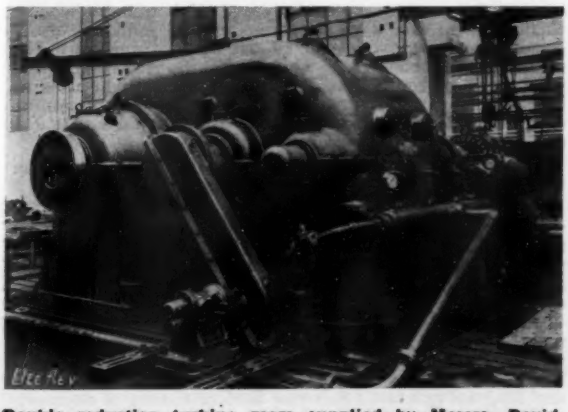
Southern Factors, Ltd.—Meeting January 13th at 1, Guildhall Chambers, 31, Basinghall Street, E.C., to receive an account of the winding-up by the liquidator, Mr. W. W. Paul.

Private Arrangement

S. Wilkinson, wireless dealer, 16, Queen Street, Withernsea.—The creditors interested herein were called together recently when a statement of affairs was submitted which showed ranking liabilities of £175, of which £160 was due to the trade and the balance of £15 to a cash creditor. In addition there were fully secured creditors for £10. After allowing £11 for preferential claims the net assets were £60, with a deficiency of £116. It was stated that the debtor commenced trading on his own account about ten months ago with a capital of £150. Recently creditors had been pressing, and in order to protect the assets a deed of assignment had been executed. It was decided that the deed of assignment already executed in favour of Mr. R. G. Collinson should be confirmed. The cash creditor would withdraw her claim.

Gear Makers' Developments in 1935

IN a review of the progress made by the company during 1935, Messrs. David Brown & Sons (Huddersfield), Ltd., state that the demand for their patent worm gears for traction drives has shown an upward trend proportionate to the expansion in all branches of industry; besides automobile, Diesel and electric railcar drives, an interesting development is recorded in an increased demand for these gears for trolley-bus and taxi applications.



Double reduction turbine gears supplied by Messrs. David Brown to I.C.I. (Fertiliser and Synthetic Products), Ltd.

Among the orders received by the company was one for a heavy type single reduction gear unit (63.5 in. centres) for a cogging mill drive supplied to Messrs. Arthur Lee & Sons, Ltd., Sheffield. The accompanying illustration shows double reduction turbine gears supplied for the coal hydrogenation plant of the I.C.I. (Fertiliser and Synthetic Products), Ltd., at Billingham. Each gear transmits 3,250 h.p. from the turbine to the 250-atmosphere hydrogen compressors, and weighs 53 tons. The company has developed a new range of bevel gear units (for reducing and increasing speed) to fulfil all modern requirements for right-angle drives. These units are specially adaptable for driving centrifugal pumps, fans, sectional and lineshaft drives. Another interesting item is the "RHV" vertical type "Radicon" reducer, the latest addition to the "Radicon" range—designed for vertical shaft drives. Six "David Brown" new vertical type bevel increasing gear units have been supplied to the order of Messrs. Worthington Simpson, Ltd., for the storm water pumps of the West Middlesex sewage scheme. The equipping of the company's new Penistone works, formerly occupied by Messrs. Cammell Laird & Co., Ltd., is nearing completion, and it is intended to commence work in the new iron foundry and pattern shop early in the New Year. Nine sets of "RHU" type "Radicon" reducers have been supplied to the order of the New Conveyor Co., Ltd., Smethwick, for the coal handling plant at the new Tir John power station at Swansea. These are for driving the conveyors, elevators and tippers. Also in connection with this plant the company supplied four sets of single helical gears for driving the Hardinge ball mills. The complete drives (one 85 h.p. and the other 55 h.p.) supplied to Yniscedwyn Tinplate Co., Ltd., Swansea, are the first all-electric cold roll drives to be installed in the Dawe Valley. Triple helical gears (90-in. centres) have been supplied for electric winders to Messrs. Markham & Co., Ltd., of Chesterfield, for the East Rand Proprietary Mines, Ltd., and heavy type single reducing gear (60-in. centres) for a rolling mill drive operating at the new Corby works of Messrs. Stewarts & Lloyds.

Electricity Supply

Lighting, Domestic, Power

Aldershot.—NEW MAINS.—The Town Council has authorised the extension of e.h.v. mains in various areas at a cost of £3,776, and is negotiating for the acquisition of sites for transformer sub-stations.

Ammanford (Carmarthenshire).—CHRISTMAS DECORATIONS.—The Silver Jubilee illuminations are to be utilised again for Christmas decorations in the town. Tradesmen providing illuminations are to be charged at the power rate.

Ashford (Kent).—EXTENSIONS.—Mains extensions are to be made at Kennington, Great Chart, Bethersden and Charing by the Urban District Council.

Australia.—BRISBANE.—Encouraging figures are given in the annual report of the Electricity Supply Department for the year ended June 30th last. There was a profit of £57,354, this being in excess of that obtained from any previous year's working, due largely to the increased sales arising out of lower charges and to the fact that more suburban areas were transferred to the Council's power house. During the year 57½ miles of overhead lines were erected, bringing the total to 780 miles. The revenue amounted to £303,471, and the working expenses to £151,018. The amount of electricity sold was 34.3 million kWh, as compared with 27.6 million kWh during 1933-34, the revenue per kWh falling from 2.53d. to 2.13d.

Bedfordshire.—ELECTRIC HEATING IN AN INSTITUTION.—The County Council has decided to install an electric heating system in part of the Luton institution.

Birkenhead.—SUPPLY TO VILLAGE.—Arrangements have been made with the Leverhulme Estates for a supply of electricity to Brimstage.

Birmingham.—EXTENSIONS AT HAMS HALL.—The Electricity Committee has prepared a scheme for extensions at the Hams Hall power station at a cost of £587,900 for plant and switchgear, £227,850 for trunk mains and £88,830 in respect of buildings.

Brighton.—MAINS.—In order to supply the Applesham estate, Portslade, mains are to be extended at a cost of £1,860.

ELECTRIC RADIATORS.—The Health Committee is to provide an electric radiator at each of the 348 houses on the Manor Farm estate.

Canada.—OUTPUT OF ELECTRIC POWER.—*Reuter's Trade Service* learns from Ottawa that central electric stations in Canada produced 2,162.6 million kWh in October, a record figure in the history of the industry in Canada. The total output for the ten months to October 31st was 19,104.6 million kWh, compared with 17,153.1 million kWh for the same months in 1934 and 14,142.8 million kWh for the same months in 1933. After deducting exports to the United States and deliveries to electric boilers, the consumption of power during the month of October was 1,452.9 million kWh. The export of power to the United States for the ten months amounted to 1,139.4 million kWh as compared with 1,038.6 million kWh for the corresponding months in 1934 and 783.6 million kWh in 1933.

Chichester.—EXTENSION TO HALNACKER.—The cables are to be extended to Halnacker on receipt of a guarantee of £40 a year.

Colchester.—SPECIAL CHRISTMAS TARIFF.—The electricity Committee has decided to supply local traders' associations with electricity for decorative lighting from December 14th to December 24th at a reduced charge, providing the supply is not taken during peak load hours.

Congleton.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £10,000 for unspecified mains, services and meters, and £650 for sub-station equipment.

Croydon.—SUPPLY EXTENSION.—The Electricity Committee is to provide a supply at a cost of £3,000 to the new bottling stores of Messrs. Charrington & Co., Ltd., in Bensham Lane, Thornton Heath. A sub-station is to be erected and mains extensions carried out at a cost of £2,850 in connection with a supply to 107 flats at Beulah Hill, Upper Norwood, and to provide a supply to the Crown Hill estate at a cost of £2,500. Mains are also to be extended in South Norwood at a cost of £725.

NEW PLANT.—Sanction has been obtained by the Electricity Committee to a loan of £150,000 for plant.

Droxford.—EXTENSION OF SUPPLY.—The Rural District Council has consented to an application by the Portsmouth Corporation for an Order to supply electricity to premises at Hundred Acres, Soberton, subject to no objection being raised by the West Hampshire Electricity Co., Ltd., the authorised suppliers in the area in question.

Duns (Berwickshire).—STREET LIGHTING.—A proposal to install electric lighting in place of gas is before the Council, which is to approach the Scottish Southern Electric Supply Co., Ltd.

Eastbourne.—LOANS.—Sanction has been received to loans for providing supplies at Bolney Wood estate, and at Eastdean and Friston.

OVERHEAD LINES.—The consent of the Minister of Transport has been received for the erection of overhead lines at Westham and Ersham Road, Hailsham.

East Retford.—WHEATLEY CONNECTED TO THE MAINS.—The chairman of the Electricity Committee (Councillor. A. Peatfield) recently performed the switching-on ceremony at Wheatley, the extension of the Corporation's mains to the village being part of a £20,000 development scheme. The work has been carried out by Messrs. Johnson & Phillips, Ltd.

Eccles.—ANNUAL REPORT.—In his 1934-35 report on the working of the electricity undertaking, Mr. H. W. Angus, the borough electrical engineer, states that at March 31st last 58 per cent. of the total number of premises in the area were supplied with electricity. There was an increase of 15.8 per cent. in the amount of electricity sold (11.1 million kWh, including 6.2 million kWh in power and 3.6 million kWh in domestic supplies). Cookers, let out on hire numbered 270, fires 85, and washboilers 68, while during the year 417 premises were wired under the assisted scheme. Street lighting is by both gas and electricity, and in connection with this it is interesting to note that the cost of gas per candle-power was 13.99d. and that of electricity 8.29d.

A view of Southbury Road, Enfield, illuminated by sixty-six "Ediswan" 400-W electric discharge lamps mounted on existing tram standards. On the right is shown Mingaladon Church, Rangoon, fitted out with G.E.C. lighting fittings and "Everest" ceiling fans

Edinburgh.—SUB-STATION.—Permission has been granted for the Corporation to erect a sub-station in Candlemaker Row.

France.—CONTROL OF ELECTRICAL INDUSTRY.—In accordance with a recent State decree a Conséil Superieure de l'Electricité has recently been appointed to direct future electric power supply developments in that country. Its duties are (1) to consider all Government and public authority regulations regarding the generation and transmission of electric power; (2) to approve, or otherwise, all demands for concessions which require Acts of Parliament or decrees; (3) to fix the date when work may be started on concessions for the establishment of hydro-electric power stations for public supply; (4) to allocate any financial assistance that may be forthcoming to electricity undertakings; and (5) to determine under certain conditions the prices to be charged by electricity undertakings. The body will be composed of five senators, five members of Parliament, two members of the State Council, and representatives of the National Economic Council, the Ministry of the Interior, the French War Office, the Public Works Department, the French Posts, Telegraphs and Telephones Department, the Ministry

of Commerce and Industry, Department of Agriculture (2), the Ministry of Labour, different classes of electric power users (25), electricity undertakings and engineers (25), departmental and municipal authorities (2), the coal mining industry, the metallurgical industry, and employés of electricity undertakings (2).

Germany.—ELECTRICITY PRODUCTION.—The State Union of Electricity Supply reports that the production of energy in 1933 by all public supply works was 7 per cent. greater than in the previous year, and a further advance of 16 per cent. took place in 1934, when the production amounted to 16.5 milliard kWh. About 85 per cent. of the total was derived from coal fuel and 15 per cent. from water power. The consumption for industrial purposes totalled 70 per cent., 15 per cent. being supplied to domestic consumers and small traders, 9 per cent. to electric trains, 5 per cent. to agriculture, and 1 per cent. to general street lighting.

Glasgow.—CONVERSION OF PLANT.—The medical officer of health is to arrange with the Electricity Department for the electrical plant at Belvidere and the eastern and western district hospitals to be converted from d.c. to a.c. at a cost not exceeding £1,625.

Gloucester.—A LARGE INCREASE IN OUTPUT.—The financial report of the Electric Supply Committee states that for the

Effective use of "Mazda" light tubes in the bedroom of a Leicester house

half-year ending September 30th there was an increase in the sales of electricity of a million kWh (40 per cent.) as compared with the corresponding period last year.

Golborne.—OVERHEAD LINES.—The Urban District Council has granted an application by the Lancashire Electric Power Co., Ltd., for permission to erect overhead lines in Holcroft Lane.

Hastings.—SUPPLY EXTENSION.—The Electricity Committee is to provide supply at a cost of £305 to Florida Farm, Beckley; to New Beach Works, Rye Harbour (£400); and to the Filsham waterworks £1,530).

SUB-STATION.—A sub-station is to be erected in Harold Place at a cost of £1,100.

Kidderminster.—OVERHEAD LINE.—The Rural District Council has consented to the Shropshire, Worcestershire and Staffs Electric Power Company erecting an overhead line at Long Bank.

Lerwick.—EXTENSION OF GENERATING PLANT.—It is proposed to install an additional generating set at the Council's power station before the winter of 1936-37.

LOWER FLAT RATE.—A reduction in the lighting flat rate to 7½d. per kWh is recommended.

London.—FULHAM.—In connection with the supply to the Earl's Court exhibition building, Earl's Court, Ltd., has now agreed to heat the whole of the buildings by the thermal-storage system and to take the electricity required from the Council. This will necessitate additional equipment estimated to cost £25,000.

ISLINGTON.—The Electricity Committee is to undertake a further scheme of mains extensions at a cost of £16,000. When this is completed all the streets in the borough will have electricity available.

Morley.—PROPOSED THREE-PHASE SYSTEM.—The Town Council is seeking the permission of the Electricity Commissioners to change its electricity system from single-phase to three-phase.

New Zealand.—WELLINGTON.—The Evans Bay power station is to be extended at a cost of £175,000. It is proposed to purchase a 15,000-kW Parsons turbo-generator and two Velox boilers.

Northern Ireland.—DEMAND FOR ELECTRICITY IN BELFAST.—At a recent meeting of the City Council it was stated that there had been over 1,000 applications for electricity supplies during the two preceding weeks. Every effort was being made by the department to keep pace with the extraordinary demands, most of which involved new services and extensions of mains.

Oswestry.—OVERHEAD LINE.—The Town Council is to complete the rural extension scheme by providing a line from Erdiston to Ruyton, at a cost of about £1,050.

Peterborough.—BULK SUPPLY RULING.—The Electricity Commissioners have ruled that, in respect of the bulk supply to Spalding Urban District Council, the fixed kilowatt charge is chargeable for the whole of 1934, and not only for the first half of the year, when the U.D.C. took electricity from the City Council.

Plymouth.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £3,000.

Portsmouth.—PURCHASE OF GOSPORT UNDERTAKING.—The Electricity Committee has now arranged to acquire the Gosport electricity undertaking for £185,000.

LOANS FOR EQUIPMENT.—The Electricity Committee has obtained sanction to borrow £100,000 for consumers' apparatus and is seeking sanction to borrow £150,000 for mains and services.

BETTER STREET LIGHTING.—Alterations and improvements are to be made in the lighting along trolley-bus routes at a cost of £1,740.

Reigate.—LOAN FOR CHANGE-OVER.—The Town Council has applied for a loan of £8,000 for additional expenditure in connection with the change-over.

Scarborough.—APPARATUS ON HIRE.—The Town Council has received permission to borrow £10,000 to defray the cost of apparatus let out on hire to consumers.

SUB-STATIONS.—A sub-station is to be erected at Quay Street, and it is also proposed to build one at Cayton Bay.

Southall.—The Metropolitan Electric Supply Co., Ltd., is to erect a sub-station in Windermere Road.

Southend-on-Sea.—FURTHER ELECTRIC-DISCHARGE LIGHTING.—Speaking at a meeting recently Councillor Cockrill said it was intended considerably to extend the electric-discharge system of lighting in the town.

Swansea.—CLOSING OF POWER STATION.—The Electricity Committee has decided to close down the old Strand power station in March, by which time it is anticipated that Tir John will be in full operation.

Swindon.—EXTENSIONS.—Mains are to be extended and a sub-station erected by the Electricity Committee to supply the Walcot estate.

Switzerland.—OUTPUT OF ELECTRICITY.—The sales of electric power during the nine months ended September last amounted

A Long Power-line Span in Norway

What is claimed to be one of the world's longest power transmission line spans was put into use last week by the Tafjord Power Co., of Aalesund, Norway. The span is suspended over the Mifjord, and has a total length of 3,883 metres, nearly 2.5 miles. The points of suspension on either shore are respectively 535 and 178 metres above sea level, so that even the largest ocean liners can pass under the cable. The firth is usually crowded with traffic, particularly in summer when many international cruising vessels pass through these waters. The cable has been made to withstand a load of 200 kg. per sq. mm. of cross section, and its weight is 7 tons. There is at present only one circuit, as the company is to attempt to use an undersea route for a second. The overhead span has cost about 13,000 kroner (£650), whereas a submarine cable would have involved an expenditure of 100,000 kroner (£5,000). The materials used are partly steel and partly bronze. Of the Tafjord Co.'s similar, but shorter, lines, one of 1,200 metres span length has been in use during the past twelve years.

One end of the Mifjord span

to 1,174 million kWh, as compared with 1,102 million kWh during the corresponding period of 1934, an increase of 7.1 per cent.

Taunton.—LOWER CHARGES.—The Town Council has approved a reduction in the electricity charges as from September 30th last as follows: Up to 500 kWh per quarter, 2½ per cent. reduction; 501 to 1,000 kWh, 5 per cent. reduction; 1,001 to 5,000 kWh, 10 per cent. reduction, and over 5,000 kWh 12½ per cent. reduction.

Wakefield.—LOANS.—The Electricity Committee is seeking sanction to borrow £5,000 for domestic apparatus and £10,000 for sub-station switchgear.

Winchester.—MAINS AND SERVICES.—The City Council has applied for a loan of £10,000 for mains and services. The mains are to be extended to give a supply to the Stanmore district, at an estimated cost of £1,372.

Ystradgynlais.—UNDERTAKING OWNERSHIP TRANSFERRED.—The South Wales Power Co., Ltd., will take over the supply of electricity to the Ystradgynlais area from the Glantawe Electrical Supply Co. at the end of the year.

Traction

Belgium.—NEW LOCOMOTIVES.—Two 1,000 h.p. double-bogie goods locomotives have been built by the A.C.E.C. for the 1,500-V d.c. Brussels to Tervueren Railway. They have four motors and Secheron individual axle drive, and are used for trains up to 800 tons in weight.

Canada.—ELECTRIC TRAMWAYS.—Evidence of economic recovery in Canada is contained in the reports of the electric tramway and suburban railway undertakings. According to *Agricultural and Industrial Progress in Canada*, there were thirty-nine systems of electric tramways and suburban railways in operation in the Dominion in 1934, of which twenty-seven reported increases in the number of passengers carried. The total number carried in 1934 was 595,143,000 as compared with 585,385,000 in 1933, an increase of 1.67 per cent.

France.—ELECTRIFICATION OF TOURS-BORDEAUX LINE.—*Reuter's Trade Service* learns from Paris that the Paris-Orléans-Midi company intends to electrify the Tours to Bordeaux line as soon as possible (the line is a continuation of the Tours to Paris section which is fed by a 90,000 V system). In the first place the plan provides for an extension of the 90,000 V system to Pessac, beyond Bordeaux, in order to link up with the power lines already laid by the Midi company. The power necessary for the trains between Tours and Bordeaux will be supplied partly by the Massif Central power stations owned by the Orléans company and partly by the Pyrenées stations belonging to the Midi company. To this end the power system will be linked to the Orléans company's stations by intermediate systems at 220,000 and 90,000 V, which have already been made over to the company, and by the Eguzon-Poitiers line now being planned. To these sources of power will be added the Midi company's stations with the help of one transformer station at Pessac and another at Angoulême, through the Pessac-Cholet 150,000-V line. The power distribution system will consist of a line between Saint Pierre des Corps and Pessac, and a line between Eguzon and Poitiers at 90,000 V. Provision will be made for doubling the initial lines if necessary. The length of the line will be 375 km. between Saint Pierre des Corps and Pessac, and 100 km. between Eguzon and Poitiers. This big electrification programme is expected to take up to three years.

Glasgow.—SUBWAY EXTENSION SUGGESTED.—At a luncheon in connection with the official opening of the electrified subway, Bailie M'Lean, convener of the Transport Committee, suggested the possibility of extending the tube system on both sides of the river. He said that such a scheme would not only reduce traffic congestion and make the streets safer, but it would make provision for the citizens in the event of air raids. The present system, the Bailie said, might well become the basis for a much larger scheme. They might have a tube running north to south, and another east to west, on both sides of the river—even from Knightswood to Carntyne, with connecting links at various points to the present system.

Hull.—TROLLEY-BUS OPPONENTS DEFEATED.—The opponents of the proposal to promote a Bill for the running of trolley-buses and the abandonment of tramways were heavily defeated at a town's meeting last week. The scheme for the introduction of trolley-buses is estimated to cost £244,000.

Manchester.—ELECTRIC TRANSPORT FAVOURED.—The Manchester and District Joint Town Planning Advisory Committee, which represents about 100 local authorities, has decided to ask the railway companies to receive a deputation to discuss the practicability of electrifying the existing railway system in the Committee's area, and in particular of constructing an underground electric railway in Manchester which should be linked with Wythenshawe and run out to Bolton, Blackpool, Southport, and Liverpool.

Newcastle-on-Tyne.—DANISH REPRESENTATIVES INSPECT TROLLEY-BUSES.—Representatives of the municipal tramways of Copenhagen, including Mr. Juel Hansen, the general manager, paid a visit to Newcastle-on-Tyne recently and inspected the Council's trolley-bus system. They were conducted by Mr. T. P. Easton (general manager), and expressed satisfaction with the silence, acceleration, and road handiness of the vehicles.

Russia.—IMPORTANT LINE ELECTRIFIED.—The first link in an extensive chain of electrified railways in the Don Basin has been completed by converting to 3,000-V d.c. electric traction the main line from Debalzevo to Chaplino, a distance of 93 miles. This line carries a heavy mineral traffic, normally made up into trains of 2,000 tons weight. Electrification is to be carried westwards to Dniepropetrovsk, southward to Saporoshie, and south-eastwards to Rostov.

Spain.—MADRID UNDERGROUND EXTENSION.—The Madrid Metro company is seeking powers from the Spanish Cortes to construct a 1¼-mile extension from the Sol to Callao and Cita Universita. The estimated cost is 12,000,000 pesetas and the time for completion two years.

RAILWAY ELECTRIFICATION.—According to the *Revista de Ingeniera Industrial* of Madrid there are at present 265 miles of electrified standard-gauge railways in Spain, with a further 110 miles in course of electrification. A big scheme of conversion to be carried out in two stages is projected. Thirteen lines, totalling 712 miles, are to be dealt with in the first stage and ten lines with a total length of 934 miles in the second.

Thanet.—FIVE TOWNS URGE RAILWAY ELECTRIFICATION.—The Mayor of Margate (Coun. E. S. Linington) presided at a conference held recently at Margate Town Hall, representative of the Ramsgate, Broadstairs and St. Peter's, Herne Bay and Whitstable local authorities also being present. It was decided to appoint a deputation to present the Councils' case in regard to railway electrification before the Southern Railway Co. It was stated that as the company's programme included a proposal to electrify the line as far as Gillingham, there seemed no reason why the remainder of the route as far as Ramsgate should not be similarly treated, thus conferring similar advantages on the five towns to those now possessed by several other seaside resorts served by the same company. The Minister of Transport and the local Members of Parliament are also being approached in the matter.

Winchester.—TRAFFIC SIGNALS.—Owing to the narrowness of the streets in the town special arrangements have had to be made in the installation of traffic signals at the junction of High Street, Jewry Street, and Southgate Street. They are to be vehicle-operated, but there will be three additional secondary pads to enable a prolonged "clearing period" to be obtained for slow traffic.

Communications

Australia.—BROADCASTING SHIP.—The Australian liner *Mancimbla*, launched from Belfast last week, will be the first vessel to receive a licence as a broadcasting ship. A programme will be transmitted to Australia and a woman announcer has been appointed.

Great Britain.—BAGHDAD TO LONDON TELEPHONE TEST.—An attempt to link Baghdad with London by telephone was successfully carried out last Friday. It is hoped to open a regular service shortly. *Reuter* learns that plans for linking Baghdad with London had been under consideration for some time. Cairo is already linked up with London by radio-telephone, and Jerusalem with Cairo by land telephone. Recently a service was inaugurated between Baghdad and Jerusalem, and it was hoped that communication could be arranged with London by way of Jerusalem and Cairo.

LICENCES.—During November 931,776 wireless receiving licences were issued, representing an increase of 95,605 during the month. The total number of licences in force numbered 7,369,239, as compared with 6,660,659 a year ago.

Southampton.—GUIDING SHIPS.—The Nab tower radio beacon, which marks the eastern approach to Southampton Water, commenced working again last week.

South Africa.—FUTURE CONTROL OF BROADCASTING.—Opening a radio exhibition at Durban, Senator Clarkson, the Minister of Posts and Telegraphs, recently indicated the Union Government's plans for the transference of the control of broadcasting from the African Broadcasting Company to a public utility trust. The new organisation, said Senator Clarkson, would probably be called the African Broadcasting Corporation. It would be controlled by a board of nine governors, the chairman of which would receive £1,500 a year, the vice-chairman £750, and the other members £400. Mr. I. W. Schlesinger, the South African financial and theatrical magnate and chairman of the present company, had accepted the Government's invitation to become chairman of the new board. The present company would be paid out in debentures to be issued by the proposed corporation, and in this way the Government would not have to find any capital for the undertaking.

Tonbridge.—RADIO FOR HOSPITAL.—The Public Assistance Committee has approved in principle a scheme costing £700 for equipping the County Hospital, Pembury Institution, with radio.

United States.—RADIO BEACONS.—When ten new radio beacons for lightships and lighthouses have been installed, states *Telegraph and Telephone Age*, every one under the jurisdiction of the United States will be equipped with this safety device. Of the new stations Capa Arago, Ore., was put into service on November 1st. At present the Lighthouse Service has 108 radio beacons in operation.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Abertillery.—January 9th. Electricity Department. Plant and equipment for change-over from d.c. to a.c. (December 6th.)

Argentina.—BUENOS AIRES.—January 21st. State Railways Administration. Underground cable, joint boxes, insulating tape, etc. (T.Y. 10269.)*

Australia.—BRISBANE.—January 17th. City Council. One 500-kW turbo-alternator. (T.Y. 10247.)*
March 10th. City Electric Light Co. 11,000-V and 415-V switchgear. (T.Y. 10264.)*
MELBOURNE.—January 29th. City Council. Totally enclosed metal-clad switchgear for the Spencer Road power station. (T.Y. 10257.)*

Beckenham.—December 30th. Borough Council. Two transformers. (December 13th.)

Beeston and Stapleford.—December 23rd. U.D.C. Electrically operated vertical spindle centrifugal pumps for new pumping station at Beeston. W. H. Radford & Son, consulting engineers, Albion Chambers, King Street, Nottingham (deposit £5 5s.).

Bexley.—January 20th. Electricity Department. Cable with jointing, transformer and switchboard. (December 13th.)

Birmingham.—January 8th. Salvage and Stables Committee. Twenty-three lead-plate batteries for electric vehicles. (See this issue.)

Blackwell.—January 8th. R.D.C. Two electrical sewage pumping installations, with vertical-spindle centrifugal pumps and motors, for the Hilcote and B. Winning sewage and South Normanton sewage disposal works extensions. A. H. Elliott, Gilcroft Chambers, Church Lane, Mansfield (deposit £2 2s.).

Breconshire.—January 6th. County Council. L.p. hot-water heating and electric lighting and power installations at the Brecon County (Girls') School. H. C. W. Strickland, County architect, Watton Offices, Brecon.

Bridgend.—January 3rd. Electricity Committee. Materials and labour in connection with underground and overhead mains extensions. (December 6th.)

Cheshire.—Joint Sanatorium Committee. Electrical installations in new laundry and new recovery wards at the Sanatorium, Burntwood, Market Drayton. G. C. Scrimgeour, clerk to the Joint Committee, St. John's House, Chester, by December 21st (deposit £2 2s.).

Coventry.—January 25th. Electricity Department. One 30,000-kW turbo-alternator and two water-tube boilers. (December 13th.)

Eastbourne.—January 7th. Electricity Department. Materials for twelve months. (December 13th.)

Edinburgh.—December 21st. Corporation. Electric lighting installation at Hillwood, Corstorphine. City architect.

Egypt.—CAIRO.—January 28th. Ministry of the Interior. Two transformer kiosks, each containing a 70-kVA transformer and 3,150-V and 220-V cable. (T.Y. 10249.)*

Great Yarmouth.—December 31st. Electricity Department. Twelve months' supply of kiosks. (See this issue.)

India.—December 20th. Bombay, Baroda and Central India Railway Co. Boxes, plates, separators, &c., for train-lighting accumulators. (December 6th.)
NEW DELHI.—January 2nd. Stores Department. Five overhead electric travelling cranes with spare parts. (T.Y. 5529.)*
January 16th. One 30-ton electric crane for the locomotive workshops, Moghalpura. Director-General, India Store Department, Belvedere Road, S.E.1 (deposit 10s., not returnable).

Irish Free State.—DUBLIN.—January 31st. Electricity Supply Board. Twelve months' supply of power transformers. (See this issue.)
January 8th. Commissioners of Public Works. Electric lighting at the Custume Barracks, Athlone. T. Cassedy, Office of Public Works (deposit £1).
SWINFORD.—January 10th. Mayo Board of Health. Electrical installations in the new fever hospital. P. J. Munden, 1, South Frederick Street, Dublin (deposit £5 5s.).

Kettering.—December 30th. Electricity Department. Cable. (December 13th.)

Lexden and Winstree.—December 31st. R.D.C. Electrically driven centrifugal well and booster pumps and base-exchange water-softening plant for the pumping station at Mount Bures. Sands & Walker, Milton Chambers, Nottingham (deposit £2 2s.).

London.—ISLINGTON.—January 15th. Borough Council. Electrical materials for one year from April 1st, 1936. (December 6th.)
METROPOLITAN WATER BOARD.—January 3rd. Portable electric generator units and centrifugal pumping plant at the Hampton pumping station. Chief engineer, Room 235, 173, Rosebery Avenue, E.C.1 (deposit £2 2s.).
CENTRAL ELECTRICITY BOARD.—January 27th. 132,000-V overhead transmission lines for the Central England Electricity Scheme, 1928. (December 13th.)

Rhyl.—December 31st. Electricity Department. L.p. cable. (December 13th.)

Roxburgh.—December 28th. County Council. Conduit at Smailholm (New) Schoolhouse. County clerk, Newtown Street, Boswells (deposit 10s. 6d.).

St. Helens.—December 30th. Electricity Department. Feeder pillars and underground disconnecting boxes. (December 13th.)

Scunthorpe and Frodingham.—December 23rd. U.D.C. Electrically driven pumping plant for two pumping stations. (December 6th.)
January 6th. Electricity Department. One sheet-steel kiosk and a 200-kVA transformer. (December 13th.)

South Africa.—PRETORIA.—January 3rd. City Council. 1,000 metal-clad switch and fuse boxes and plugs and sockets. (T.Y. 10254.)*
JOHANNESBURG.—January 7th. Rand Water Board. Electrically driven induced-draught fan with steam turbine and accessories. (T.Y. 5563.)*

Southend-on-Sea.—January 9th. Electricity Department. H.p. underground cables. (December 13th.)

Southport.—December 28th. Transport Committee. Electrical installation at the transport depôt. (See this issue.)

Spalding.—Electricity Department. Cable and copper conductors. (December 13th.)

Stockport.—January 7th. Sewage Outfall Committee. Electric motors, &c. W. F. Gardner, borough surveyor, Town Hall (deposit £2 2s.).

Swindon.—January 10th. Electricity Department. Underground h.p. cables and sub-station equipment. (December 13th.)

Uruguay.—MONTEVIDEO.—February 7th. State Electricity Supply and Telephone Administration. Underground armoured cable. (T.Y. 10259.)*
February 10th. Static transformers. (T.Y. 10260.)*

Wednesbury.—December 31st. Borough Council. Electric wiring and fittings, &c., in houses, shops and maisonnettes to be erected on the Dangerfield Lane, Crankhall Lane (West), Bilston Road (South) and Short Street (Clearance) sites. A. Booth, Borough engineer, Town Hall (deposit £1 1s.).

West Riding.—December 30th. County Council. L.p. hot-water apparatus and electric lighting for the extensions of Upton Council school. Education officer, County Hall, Wakefield.

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 36, Old Queen Street, London, S.W.1.

Contracts Closed

Bromley.—Electricity Department. Recommended. Wiring and fittings for electricity in houses and flats on the Turpington housing estate.—W. E. & S. Rumph, Keston.

Dartford.—Electricity Committee. Accepted. Cables (£703).—Hackbridge Cable Co., Ltd.

Hastings.—Electricity Committee. Recommended. Transformers.—Lindley Thompson Transformer & Service Co., Ltd.; Yorkshire Electric Transformer Co., Ltd.; Ferranti, Ltd. Poles, stay blocks, ironwork, &c. (£2,000).—W. T. Glover & Co., Ltd.

Middlesex.—Education Committee. Accepted. Electric lighting at Rectory Farm schools (£646).—G. A. Weston, London.

Glasgow.—Health Committee. Accepted. Radiological apparatus required at Stobhill Hospital (£5,182).—Victor X-Ray Corporation, Ltd.
Transport Committee. Accepted. Lead-covered cable (£2,287).—Craigpark Electric Cable Co., Ltd.

London.—ISLINGTON.—Electricity Committee. Recommended. Extension of contract for transformers for twelve months.—Hackbridge Electric Construction Co., Ltd.
HACKNEY.—Electricity Committee. Recommended. Renewal of existing contracts, expiring on December 31st, for the period to March 31st, 1937: Transformers.—Johnson & Phillips, Ltd. Switchgear.—Harland Engineering Co., Ltd.
STEPNEY.—Electricity Supply Committee. Recommended. Supplies during the year commencing January 1st, 1936: 90,000 yd. of tough rubber sheathed cable (£696).—Wholesale Fittings Co., Ltd. 43,000 yd. of v.i.r. cable (£388).—Mersey Cable Works, Ltd. Supply of conduit during November (£148).—Albion Clay Co., Ltd. 880 yd. of 10,000-V l.c. cable in connection with the reorganisation of the e.h.p. system (£155).—W. T. Henley's Telegraph Works Co., Ltd.

Northern Ireland.—BELFAST.—Tramways Committee. Accepted. Electric lighting and heating of the floral hall at Bellevue (£1,861).—G. McCartney & Co.
LONDONDERRY.—Corporation. Accepted. Extensions of generating plant (£23,496).—Metropolitan-Vickers Electrical Co., Ltd.

St. Andrews.—Town Council. Accepted. Electrical installation at the Muttoes Lane housing scheme.—R. Bell.

Wakefield.—Housing Committee. Accepted. Electric wiring at seventy-four houses on the Horbury estate.—H. Goodyear.

Wolverhampton.—Electricity Committee. In our last issue we stated that a contract for a 1,500-kVA and two 200-kVA transformers had been awarded to the British Electric Transformer Co., Ltd. This, we regret, was incorrect, the successful tenderer being the Electric Construction Co., Ltd.

Worthing.—Electricity Committee. Accepted. Two transformers (£356).—Lindley Thompson Transformer & Service Co.

Notes

The Earl's Court Exhibition

Referring to the article on the first section of the Earl's Court Exhibition which appeared in our issue of December 6th, the Central Electricity Board tells us that an agreement has been concluded between the organisers and the Fulham Electricity Department for a supply of electricity through its new generating station, the first section of which is nearing completion. Approximately five million kWh a year will be used for lighting and power, and in addition an electric thermal-storage plant is to be installed consuming between eight and eleven million kWh annually. The thermal-storage plant will provide for the air-conditioning of the building and also the heating of a large swimming pool, the whole of the plant being automatic and thermostatically controlled. The electricity for the boilers will be supplied by arrangement during off-peak hours.

Electrical Domestic Science School's Successes

At the presentation of certificates at the London School of Electrical Domestic Science, Knightsbridge, on Friday, Miss H. M. M. Minoprio, the principal, stated that in the E.A.W. examinations in January and June eighteen of the nineteen candidates who had entered from the school had passed, three obtaining distinction. Miss Caroline Haslett, who presided, congratulated the school on its record, and Captain J. M. Donaldson, chief engineer of the Northmet Co., presented the certificates. Among others who spoke were Col. R. E. Crompton, Dr. K. F. Lund and Mr. E. E. Sharp.

I.E.E. Students' Dance

The London Students' Section of the Institution of Electrical Engineers held a dance at the Imperial Hotel, Russell Square, W.C., on December 11th. This delightfully informal function always attracts a large number of the younger members of the Institution. Mr. J. M. Kennedy (the president) "looked in" and stayed to join in the gaiety. Mr. J. P. Harvey, the hon. assistant secretary for entertainments, arranged the function.

A Distribution Problem

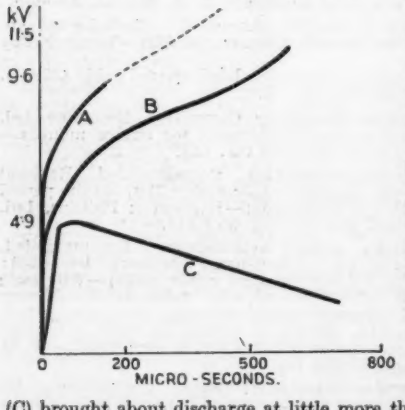
From a London evening paper, December, 1935:—"Twenty years ago, houses at Hartley, Kent, were fitted with gas fittings. The fittings remain, but Hartley folk are still waiting for a supply of gas. This was revealed by Capt. C. S. Bignell at a meeting of the Parish Council. The Clerk said it was likely that gas would be available for the village in the near future."

Low-voltage Neon Tubes

In an article that appeared in our issue of November 22nd on recent developments in low-voltage neon tubes we referred to researches in Great Britain relating to the adoption of the negative-glow discharge. We are now in a position to state that the results recorded were achieved by Mr. Paul Freedman, who has been working on gaseous-discharge problems for many years and expects to provide us shortly with further information on the subject.

Lightning Surges

The accompanying curves, taken by means of a cathode-ray oscillograph by the E.A.G. Wadenswil (Zurich), are reproduced from diagrams sent us by the Anglo-Swiss Electrical Co., Ltd. They indicate the elimination of the wave peak by the use of a pre-ionised spark gap. For (A) and (B) a spark gap consisting of balls 30 mm. in diameter was employed. In (A) there was a considerable time lag in the discharge, and in (B) no discharge occurred. The pre-ionisation spark gaps (C) brought about discharge at little more than half the over-voltage of (A) and as will be clearly seen without appreciable time lag.



The Borough Polytechnic

The annual exhibition of students' work was held last Friday and Saturday at the Borough Polytechnic, the laboratories being thrown open to enable visitors to examine the equipment.

Temperature Measurement

Essential information regarding generally used methods of temperature measurement has been brought together in a new publication by the Cambridge Instrument Co., Ltd., entitled "The Accurate Measurement of Temperature" (1s. 6d. post free). The first section covers theory and application in a concise and readable form and is supplemented by a bibliography for the benefit of those wishing more detailed information regarding any particular type of equipment. The tables of constants and comparisons of methods which have been compiled from authoritative sources, have been brought together, it is believed, for the first time in this form. The second section gives comparative data of all the usual types of instrument, ranging from the simple mercury-in-glass thermometer to the optical pyrometer for ascertaining the highest temperatures.

A Hydraulic Laboratory

The new laboratory constructed at the Park Royal Works of Electroflo Meters, Ltd., provides an extension of facilities for the conduct of research and meter performance tests. Here meters for pipelines up to 30 in. in diameter can be subjected to weighted water accuracy tests. Provision is also made for testing V-switch and open-channel meters and feed-water meters and for investigating fluid-flow measurement problems. From the electrical aspect the most interesting product of the works is the electric flow meter, of the type supplied to Battersea power station (including the new 105,000-kW turbine and three boilers) and to the Fulham station under construction for its six boilers, two turbines and house set. This differs from other distant transmitters of instrument readings in being purely electrical; *i.e.*, the flow through a pipe is translated into electrical energy. The differential pressure derived from a Venturi tube displaces the mercury column in a U tube, but in the downstream leg instead of the usual float there is a series of conductive rods connected at intervals to a wire-wound resistance, the value of which is reduced proportionally with the increase of the rate of flow. The movement of the mercury column being entirely unrestricted, it is able to take up a position accurately corresponding with the differential and the absence of inertia ensures sensitivity. The a.c. for the meter is transformed to 40 V. The consumption at maximum flow is 80 W and the instrument is unaffected by variations of the supply voltage within ± 20 per cent.

Pumping plant, sump and measuring tanks at the hydraulic laboratory of Electroflo Meters, Ltd.

Electrodeposition of Tin

Recent improvements in the technique of electrodeposition of tin resulting from the use of alkaline stannate baths have led to the increasing use of electrodeposited tin coatings for the protection of other metals against corrosion. For some purposes, for example where the coatings have to withstand abrasion from cleansing materials, coatings with improved resistance to wear would be advantageous. The possibility of modifying the baths to produce coatings of tin alloyed with other metals in order to harden them has been preliminarily investigated by Messrs. R. G. Monk and H. J. T. Ellingham, whose researches are described in Technical Publication Series A, No. 25, just issued free of charge by the International Tin Research and Development Council, Manfield House, 378, Strand, London, W.C.2. Other recent investigations are dealt with in booklet No. 22, describing how tinplate can be improved in quality by superimposed electrodeposition of tin. Booklet No. 4 deals with tin and its uses, and No. 5 is entitled "Tin and Civilisation."

Appointments Vacant

Electrical technician for the Government of Hong Kong.

Lady cookery demonstrator and saleswoman for Tynemouth Electricity Department.

Lady demonstrator for Bath Electricity Department.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

BEAVER pump.

PHILALURAX aluminium kettle.

TELL-ARAY reflector.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Prof. W. Cramp has been appointed president of the Engineering Section of the British Association, which is holding its annual meeting next year in Blackpool.

Mr. R. H. Rawll, who is the author of the article "Frequency and Voltage Change," on page 847, was educated at the Grocers' Company's School, London, and the Hackney Technical Engineering Institute. His practical training was gained with Messrs. Dick, Kerr & Co., Ltd., and also as a pupil in the Electrical Department of the L. & N.W. Railway Co. Entering the service of the City of Birmingham Electric Supply Department in 1922 as junior assistant engineer, he subsequently became district installation engineer, chief assistant to the engineer responsible for the change-over of the Birmingham system from 5 kV, 28 cycles, to 11 kV, 50 cycles, and in 1932 took entire charge of this work as frequency change engineer, being directly responsible to the city electrical engineer. He is hon. assistant secretary of the South Midland Centre of the I.E.E., and is a member of the North West Midlands Joint Electricity Authority, the No. 5 Area District Joint Board of Employers and Staff, and of the National Executive Council of the E.P.E.A. During the war he served with the London Electrical Engineers, and subsequently held a commission in the Royal Air Force. He is an associate member of the Institutions of Electrical and Mechanical Engineers.

[*Elliott & Fry*
Mr. R. H. Rawll

Mr. R. D. Ball, the joint author with **Mr. L. Roberts** of the article on "Single Phase Motors" which appears on page 851, commenced his electrical experience with the Lancashire Dynamo & Motor Co., and Manchester School of Technology, and joined the English Electric Co.'s Dick, Kerr works at Preston in 1922. He was later transferred to the Central Design Department of the English Electric Co. in London, and for two years acted as personal assistant to the chief electrical designer. During his stay in London he became a part-time demonstrator at the Polytechnic, Regent Street, and a part-time lecturer at the University College, Gower Street. He subsequently left London for Stafford to act as personal assistant on the electrical side to the company's chief consulting engineer. In 1931 Mr. Ball became an associate of the American Institute of Electrical Engineers, and he is the author of several articles that have appeared in the journal of that Institute. Subsequently he took up the position of chief electrical designer (industrial) at the company's Bradford works, a position which he still occupies.

[*Elliott & Fry*
Mr. R. D. Ball

[*Walter Scott*
Mr. L. Roberts

Mr. L. Roberts is manager of the Industrial Sales and Engineering Department of the English Electric Co.'s Bradford works. He received his technical education at the Technical College, Bradford, and at the Manchester School of Technology, and he gained works experience with the British Westinghouse Co., Trafford Park, and the Phœnix Dynamo Co., Bradford, becoming assistant designer of the latter company under Dr. Pohl. At a later date he became chief designer for the Phœnix Dynamo Co., which was later embodied in the English Electric Co. About seven years ago Mr. Roberts took up the position of works manager at the English Electric Co.'s Bradford works, in addition to his post as chief industrial motor designer.

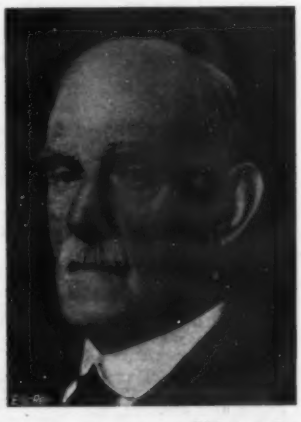
Mr. H. Webber has recently completed twenty-five years' service as electrical engineer to the Keighley Corporation, and to mark the occasion he was presented on December 11th with a grandmother clock on behalf of the staff of the Electricity Department, by the Mayor of Keighley, at the annual dinner of the Department.

The presentation to Mr. H. Webber
Left to right: Messrs. H. Dalton (mains engineer), H. Webber, H. E. Hargreaves (senior charge engineer), E. Dadswell (maintenance engineer), and J. Heaton (chief clerk)

Mr. W. A. Fraser, mains superintendent, has been appointed distribution engineer to the Belfast Corporation Electricity Department to fill the vacancy caused by the resignation of Mr. B. Croft, and **Mr. R. P. Watson**, assistant mains engineer, has been appointed mains engineer. **Mr. R. A. O'Neill** has been placed in charge of the sub-stations department.

Obituary

Sir Richard T. Glazebrook.—We regret to record the death of Sir Richard Tetley Glazebrook, K.C.V.O., K.C.B., D.Sc., F.R.S., which occurred on December 15th at his residence at Limpsfield Common, Surrey, at the age of eighty-one. Known best to the public by his aeronautical research, which established aviation on a scientific basis (he was chairman of the Aeronautical Research Committee from its inception until 1933, Zaharoff Professor of Aviation and Director of the Aeronautics Department of the Imperial College of Science and Technology, and gold medallist of the Royal Aeronautical Society), Sir Richard is most closely associated by electrical men with the National Physical Laboratory. Here he held the post of director from its formation in 1899 until 1919, during which period he constructed and evaluated electrical standards, the indirect effect of which on the engineering industry is almost incalculable. Among his literary activities, which included studies of the theory of light and the determination of the fundamental electrical units, "The Dictionary of Applied Physics" is outstanding as an authoritative source of definition of principles, and a storehouse of the knowledge available at the time of its publication in 1923. He had been a member of the Institution of Electrical Engineers since 1900; he became President in 1906, and was elected an honorary member in 1930. Other positions of scientific eminence that he filled included those of President of the Physical Society, and of the Optical Society. Sir Richard was born in Liverpool and was educated at Dulwich and Liverpool Colleges, and at Trinity College, Cambridge (where he secured distinction as Fifth Wrangler), and later became assistant director of the Cavendish Laboratory, and for a short period principal of University College, Liverpool. The importance of his work was recognised, in the form of honorary degrees, by several universities.



[*Elliott & Fry*
The late Sir Richard Glazebrook

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Mid-Wales Electric Power Co., Ltd.—Public company. Registered December 12th. Nominal capital, £100,000 in 150,000 5 per cent. cumulative preference shares of 10s. each and 250,000 ordinary shares of 2s. each. Objects: To apply for, acquire and obtain any Order, Act of Parliament, licence, concession or other power, authority or right for the supply of electricity, for any public or private purposes, and electrical undertakings; and to carry on the business of suppliers of electricity. Power is taken to manufacture and deal in radio apparatus. The directors are: Sir Charles A. Harris, K.C.M.G., C.B., C.V.O., Greenhill Brow, Farnham, Surrey (chairman of Hillman's Airways, Ltd.), W. C. Hands, 6/8, Gorleston Street, North End, W. Kensington, W.14 (director of Whitworth Electric Lamp Co., Ltd.), and T. W. Cond, Carisbrooke, Radnor Road, Twickenham. The directors' borrowing powers are restricted to an amount not exceeding twice the authorised capital. Registered office: 50, Pall Mall, S.W.1.

MacWhirter, Ltd.—Private company. Registered December 11th. Capital, £5,000 in £1 shares. Objects: To carry on the business of manufacturers of mechanical and electrical machinery, toolmakers, brassfounders, agents for and dealers in automatic refrigeration, auto-electric equipment, &c. The directors are: A. C. MacWhirter (permanent governing director and chairman), and Mrs. J. L. MacWhirter, both of 16, Cyncoed Road, Cardiff. Solicitors: Macintosh, Thomas & Co., 8, St. John's Square, Cardiff.

Langcroft Radio, Ltd.—Private company. Registered December 9th. Capital, £1,000 in £1 shares. Objects: To carry on the business of wireless, electrical, mechanical and general engineers, &c. The directors are: R. A. Brown, "Langcroft," St. Peter's Road, Huntingdon, and G. W. Hanson, Station House, Abbots Ripton, Hunts.

Radio and Electrical Industries Trust, Ltd.—Private company. Registered December 7th. Capital, £1,000 in 5s. shares. Objects: To carry on the business of manufacturers of and dealers in gramophones and sound reproducing machines, radio and electrical engineers, bankers, financiers, hire-purchase financiers, &c. The directors are: W. A. Brown (chairman), 14, Victoria Road, Swindon, and J. W. C. Robinson, "House of Green Ginger," Hinchley Drive, Esher, Surrey. Registered office: Bush Lane House, Bush Lane, Cannon Street, London, E.C.4.

Ben Johnson (Radio), Ltd.—Private company. Registered December 9th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical apparatus, wireless sets, valves, gramophones, &c. The directors are: Hannah M. Berks and Rachel Berks, both modistes, of 1, Westbourne Avenue, Hull. Registered office: 80c, Cranbrook Road, Ilford.

Savoy Refrigerators, Ltd.—Private company. Registered December 7th. Capital, £4,000 in 3,885 participating preferred shares of £1 each and 2,300 ordinary shares of 1s. each. Objects: To adopt an agreement with R. E. H. Heenan, J. N. D. Heenan, P. B. Silk and G. Kay and to carry on the business of manufacturers, importers and exporters of, agents for, and dealers in refrigerators, radio and television apparatus, electrical goods and appliances, &c. The first directors are R. E. H. Heenan, J. N. D. Heenan and P. B. Silk. Solicitors: Zeffertt & Heard, 17, Coleman Street, London, E.C.

Telephone Equipment Co., Ltd.—Private company. Registered December 7th. Capital, £200 in £1 shares. Objects: To carry on business as electricians and mechanical engineers. &c. The subscribers are: L. W. Dethier, Lauristan, Bourne Way, Hayes, Kent, and L. N. Pocock, 173, Queensway, West Wickham, Kent. L. W. Dethier is first and permanent director. Registered office: 10, Bolt Court, Fleet Street, E.C.4.

Returns of Electrical Companies

M.C.S. Manufacturing Co., Ltd.—The nominal capital has been increased by the addition of £4.000, in £1 ordinary shares, beyond the registered capital of £1,000.

Drury Radio Co., Ltd.—Capital, £2,000 in £1 shares. Return dated July 11th, 1935. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Boxer Radio Co., Ltd.—Capital, £550 in £1 shares. Return dated July 29th, 1935. 501 shares taken up. £453 10s. paid (£1 on 451 shares and 1s. on 50 shares). Mortgages and charges, nil.

Ashton Electrical Co. (Preston), Ltd.—Capital, £1,500 in 250 founders' and 1,250 ordinary shares of £1. Return dated July 12th, 1935. All shares taken up. £1,350 paid on 250 founders' and 1,100 ordinary shares, £150 considered as paid on 150 founders' shares. Mortgages and charges, nil.

J. W. Gray & Son, Ltd.—Capital, £10,000 in 40.000 shares of 5s. Return dated July 4th, 1935. 36,000 shares taken up. £6,000 10s. paid, £2,999 10s. considered as paid. Mortgages and charges, nil.

Elektromekano Co. (London), Ltd.—Capital. £100 in 2,000 shares of 1s. each. Return dated August 14th, 1935. All shares taken up. £100 paid. Mortgages and charges, nil.

Adamant Supplies Co., Ltd.—Capital, £5,000 in £1 shares. Return dated August 10th, 1935. 2.603 shares taken up. £502 paid, £2,101 considered as paid. Mortgages and charges, nil.

R. Darbyshire (Wholesale), Ltd.—Capital, £2.000 in £1 shares. Return dated August 31st, 1935. 1,435 shares taken up. £1,435 paid. Mortgages and charges, nil.

Kenneth E. Beswick, Ltd.—Capital, £1,500 in £1 shares. Return dated July 8th (filed August 23rd), 1935. 1,202 shares taken up. £2 paid, £1,200 considered as paid. Mortgages and charges, nil.

Barkers Wireless, Ltd.—Capital, £500 in £1 shares. Return dated August 30th, 1935. Three shares taken up. £3 paid. Mortgages and charges, nil.

A. E. Ponton & Sons, Ltd.—(a) Particulars filed of debentures not exceeding £2,100 authorised September 20th, 1935, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £2,100. (b) Charge on 21, 23 and 25, Shelbourne Road, Bournemouth (formerly 1 and 2, Lowry Villas), dated September 20th, 1935, to secure £2,500. Holder: A. A. M. G. Mauleverer, 204, Holdenhurst Road, Bournemouth.

Concordia Electric Wire Co., Ltd.—Capital, £100,000 in £1 shares. Return dated August 28th, 1935. 57,319 shares taken up. £57,319 paid. Mortgages and charges, £33,000.

Electric Cushions, Ltd.—G. H. Warmington, C.A., of Portland House, 73, Basinghall Street, London, E.C., was appointed receiver and manager on December 2nd, 1935, under powers contained in debenture dated December 3rd, 1935.

Tungsten Electric Co., Ltd.—The nominal capital has been increased by the addition of £1,900 in £1 ordinary shares beyond the registered capital of £100.

Teignmouth Electric Lighting Co., Ltd.—The nominal capital has been increased by the addition of £20,000 in £1 ordinary shares beyond the registered capital of £60,000.

Bursiem's Patents, Ltd.—Particulars filed of £2,000 debentures, authorised November 20th, 1935, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £500.

Hawnt & Co., Ltd.—Particulars filed of £1,500 debentures authorised November 12th, 1935, charged on the company's undertaking and property, including uncalled capital, the amount of the present issue being £1,200.

Radium Electric, Ltd.—Capital, £5,000 in £1 shares. Return dated June 17th 1935. All shares taken up. £5,000 paid. Mortgages and charges, nil.

International Marine Radio Co., Ltd.—Capital, £60,000 in £100 shares. Return dated July 3rd, 1935. 450 shares taken up. £45,000 paid. Mortgages and charges, nil.

London Nigerian Power Co., Ltd.—Capital, £100,000 in 5s. shares. Return dated August 13th, 1935. 301,607 shares taken up. £401 15s. paid on 1,607 shares. £75,000 considered as paid on 300,000 shares. Mortgages and charges, nil.

Edwards and Marshall, Ltd.—Capital, £1,500 in 1,400 preference and 100 ordinary shares of £1. Return dated March 30th (filed September 26th), 1935. 950 preference and 100 ordinary shares taken up. £1,050 considered as paid. Mortgages and charges, nil.

Electric Light Wood Fittings Co., Ltd.—C. H. Brand, of 36, Walbrook, E.C., was appointed receiver and manager on December 3rd, 1935, under powers contained in debenture dated June 21st, 1934.

Radio By-wire (Beverley), Ltd.—Capital, £2,000 in £1 shares. Return dated August 9th, 1935. 1,005 shares taken up. £505 paid. £500 considered as paid. Mortgages and charges, nil.

Radio Improvement Co., Ltd.—Capital, £500 in £1 shares. Return dated June 28th (filed August 24th), 1935. 302 shares taken up. £302 paid. Mortgages and charges, nil.

Exeter Radio Exchange, Ltd.—Capital, £5,000 in £1 shares. Return dated August 7th, 1935. 4,930 shares taken up. £4,930 paid. Mortgages and charges, nil.

Mervyn Sound & Vision Co., Ltd.—The nominal capital has been increased by the addition of £3,400 beyond the registered capital of £100. The additional capital is divided into 2,800 ordinary shares of 10s. and 2,000 5 per cent. cumulative participating preference shares of £1.

City Notes

Mid-Wales Electric Power Co., Ltd.—This company, whose registration is recorded in the opposite column, has been formed to acquire shares in electricity companies and undertakings. It has a share capital of £100.000 (in 150,000 5 per cent. preference shares of 10s. and 250,000 ordinary shares of 2s.), and a loan capital of £50,000 4½ per cent. mortgage debenture stock. Its first operation is the acquisition of the Yale Electric Power Co., Ltd., which has a paid-up capital of £17,700 and for this purpose the whole of the debenture stock was offered at par on Tuesday this week. According to the prospectus the Yale Co. has an 800-kW d.c. hydro-electric generating station and purchases a bulk supply from the North Wales Power Co., having a 550-kVA sub-station for this purpose. During the current year there has been an output of over 1,300,000 kWh. The profits for the past four years, after charging working expenses but before providing for depreciation, interest on loans (since repaid), income tax and directors' fees, have been as follows:—1931-32, £3,635; 1932-33, £3.636; 1933-34, £3,174; and 1934-35, £4,110. There are about 1,600 consumers and it is considered that 800 more can be secured for lighting supplies "as well as a number of consumers for heating and other domestic purposes." The cash at bank of the Yale Co. on December 9th was £1.824, which is considered to be ample working capital for the Yale Co. The contracts detailed in the prospectus include one by which Mr. R. H. Mayhew on behalf of himself and all other shareholders of the Yale Co. agrees to

sell the whole of the company's issued share capital to Messrs. Arthur Johnson & Partners for £50,000 in cash. Mr. H. D. Hands has agreed to subscribe at par 50,000 ordinary shares of 2s. each. Messrs. Arthur Johnson & Partners have agreed to sell to the Mid-Wales Co. the whole of the issued share capital of the Yale Co. for £69,250 (£49,250 in cash and the balance in 2s. ordinary shares); and they also undertake to pay the flotation expenses up to and including the allotment of the debenture stock which they agree to underwrite in consideration of a commission of 1½ per cent. on the nominal amount. The company reserves power to create and issue further debenture stock (not to exceed £200,000, including the present issue) to rank *pari passu* with this issue.

West of England Electric Investments, Ltd.—The subscription list was opened on Tuesday last for the sale by Messrs. Lazard Bros. & Co., Ltd., of £500,000 3½ per cent. debenture stock at 99½ per cent. The West of England Electric Investments, Ltd., own the whole or majority of the ordinary shares of the following eleven companies operating in Devon and Somerset over an area of 1,400 sq. miles with a population of approximately 220,000:—Bideford & District E.S. Co., Braunton E.L. & P. Co., Culm Valley E.S. Co., Dawlish E.L. & P. Co., East Devon Electricity Co., Exe Valley Electricity Co., Minehead E.S. Co., Wellington District Electricity Co., Paignton E.L. & P. Co., Porlock & District Electric Co., and the Teignmouth E.L. Co. At the end of 1934 the system included 265 miles of high voltage and 360 miles of low voltage transmission lines, the kWh sold was 12,400,000 and the consumers were 25,450. It is estimated that at the end of the current year the sales will reach 15,000,000 kWh and the consumers 29,000. The purpose of the present issue is to provide funds for the repayment of a £500,000 unsecured loan from the Whitehall Electric Investments, Ltd., which holds the whole of the company's ordinary share capital.

The British Vacuum Cleaner & Engineering Co., Ltd.—Presiding at the annual meeting held on Monday last Mr. H. Cecil Booth (chairman and managing director) said that the trade of the company, both as regarded turnover and profits, had once more surpassed all previous records. It had been necessary during the past year to add to their accommodation and further extensions to their factory were now in hand. Additional steps had been taken to develop their overseas trade with the British Dominions, and they had created a subsidiary company in Canada. The directors were considering the question of a rearrangement of the ordinary share capital, and would take the shareholders into their confidence immediately they came to a final decision. Owing to the increased business during the past few years and with a view to providing for further development they considered it desirable to increase the working capital, and the board was now considering a preference share issue. Shareholders would be informed in the near future of the form which this issue would take.

Warner's Radio & Electric, Ltd.—The prospectus was published on Tuesday last for an issue of 120,000 6 per cent. cumulative preference shares of 10s. each at par and 240,000 ordinary shares of 1s. each at 2s. per share. The company has an authorised share capital of £120,000, made up of 120,000 6 per cent. cumulative preference shares of 10s. each and 1,200,000 ordinary shares of 1s. each. It has been formed to acquire, as a going concern, as from September 30th last, the business of retail distributors of radio apparatus and components, electric lighting and heating apparatus, fittings, &c., carried on by Warner's Electrical Trust, Ltd. (now in voluntary liquidation), together with the leasehold premises, assets and the goodwill of that company in connection with its various undertakings, including seven retail branches opened since September 30th last. 920,000 ordinary shares, credited as fully paid up, will be issued to the shareholders in the vendor company as part of the purchase consideration of £72,500, and 40,000 ordinary shares credited as fully paid up will be issued in respect of services in connection with this issue. The balance of the purchase price (£26,500) is payable in cash. The additional working capital rendered available from the proceeds of the issue will be utilised for extending the scope of the company's business. The profits are set out for the past three years to September 30th last and are as follows:—Period October 5th, 1932, to September 30th, 1933, £6,470; year ended September 30th, 1934, £8,268; year ended September 30th, 1935, £24,782.

Petters, Ltd., announce that the improved financial position of the company, following the sale of one-half of the shares of Westland Aircraft, Ltd., in July last, enables it to recommend the payment of the dividend on the preference shares in arrears for the two years ended March 31st, 1935, and the payment of a half year's interim dividend on the preference shares for the current year. It is also proposed to make a distribution to the ordinary shareholders in the form of a cash bonus of 2s. per share, free of tax. The company states that it is sharing in the general improvement in trade, notwithstanding continued difficulties relating to export trade. New articles of association will be proposed at a meeting to be held in the New Year. Capt. A. S. Keep, having relinquished his duties in connection with Westland Aircraft, Ltd., has resigned from the board of the company, and Mr. W. E. W. Petter, who is a director of the Aircraft Co., finds his time fully occupied with that company, and has also resigned from the board of Petters, Ltd.

Crompton Parkinson, Ltd., held their annual meeting on December 13th. Mr. Frank Parkinson (chairman and joint managing director) presiding. Mr. Parkinson's speech was circulated to shareholders some time before the meeting and was reported in our issue of November 29th, page 767. At an extraordinary meeting which followed the annual meeting resolutions were passed increasing the capital of the company to £1,500,000 by the creation of a further 2,000,000 "A" ordinary shares of 5s. each, ranking *pari passu* with existing "A" ordinary shares. A sum of £241,295, part of the reserves, is to be capitalised and applied in paying up in full 965,176 "A" ordinary shares to be distributed credited as fully paid among ordinary and "A" ordinary shareholders, at the rate of one new fully-paid share for each ordinary or "A" ordinary share held. The new shares will rank for dividend as from October 1st, 1935.

The General Cable Manufacturing Co., Ltd., held its annual meeting on December 12th, when Mr. C. W. R. Pantlin (chairman), who presided, said that although it was the first annual meeting of the company since it was converted into a public company in November of last year, the business was established in 1915. The result of the new company's first year's trading was most satisfactory. The sales were more than maintained, the turnover being the largest in the history of the business. The chairman said that the management was hopeful of maintaining the profits for the current year, despite the fact that during the past few months there had been a marked movement in the price of raw materials.

Enfield Rolling Mills, Ltd., reports a net loss of £16,859 for the year ended September 30th last, after transferring £8,643 from share premium account. This compares with £32,146, (£19,999 from share premium account). The debit balance of £29,243 brought in is raised to £45,103. The report states that since the beginning of September the business has been conducted on a profitable basis, and the directors anticipate that satisfactory results will be shown for the current year. It is proposed to increase the capital to £600,000, and to offer 140,000 £1 shares at 20s. 6d. each to existing shareholders in the proportion of one new share for every three shares held. Meeting: December 20th.

The Ceara Tramway, Light & Power Co., Ltd., reports a net revenue for the year ended June 30th last of £14,725 as compared with £13,564 for 1933-34. After charging debenture interest, &c., and reserving £9,447 for depreciation, the balance carried forward is increased from £7,857 to £11,136. The sum of £9,873 arrears of interest on the first debenture stock, which was cancelled under the scheme approved last May, has also been carried to reserve.

Electricity Supply Merger.—Sanction having been given for the necessary increase in the capital of the Metropolitan Electric Supply, Co., the terms under which the company proposes by an exchange of shares to absorb the business of the Notting Hill Electric Lighting Co., Ltd., have now been announced. The ordinary share capital of the Notting Hill Company is to be taken over by the exchange of shares in the proportion of eleven Metropolitan to ten Notting Hill shares.

Mann, Egerton & Co. report a profit for the year ended September 30th last of £33,319, as compared with £32,334 for the preceding year. It is proposed to pay a dividend of 2s. per share on the 11s. ordinary shares, to place £10,000 to reserve, and to carry forward £16,212, against £16,187 brought in.

The Victoria Falls & Transvaal Power Co. has declared an interim dividend of 4 per cent. on the ordinary shares (unchanged).

The United River Plate Telephone Co. is paying an interim dividend of 2 per cent. less tax, on the ordinary shares (same).

The Lisbon Electric Tramways, Ltd., is maintaining its interim ordinary dividend at 3 per cent.

Stocks and Shares

MONDAY EVENING

GENERAL conditions in the Stock Exchange are being dictated at the moment more by peace prospects than by monetary considerations or by the ordinary end-of-the-year factors. One day it is thought that peace between Italy and Abyssinia is within sight, and prices improve; on the next day, the hopefulness becomes damped and there is a disposition on the part of prices, and of business, to decline. What may be called the fundamental factors, apart from the war itself, remain unchanged. Money is abundant and cheap; there is a manifest willingness on the part of investment to seek stocks and shares for employment of capital; trade at home is good, and the Board of Trade returns, published earlier this week, show satisfactory figures, both in the exports and imports.

Stock Exchange dealings are now for settlement on the Account Day, January 9th, which means that the present purchasers will not be called upon to pay for their securities until the day mentioned: they are able to retain their money in the bank over the New Year's Day upon which most people like to make a fair show. Prices keep firm as a whole. The shares connected with electrical equipment obtain a greater share of activity than prevails in most of the other markets.

New Issues

The Mid-Wales Electric Power Company offered, on Tuesday in this week, £50,000 of 4½ per cent. mortgage debenture stock at 100. Another new issue just out is 120,000 of 6 per cent. preference shares of 10s. each, offered at par, and 240,000 ordinary shares of 1s. each, at 2s., in the Warner's Radio and Electric Company. A number of new issues stand on the point of appearance. Their débuts may be delayed by the uncertainty of the international situation, complicated as this is rumoured to be by divergence of opinion amongst Cabinet ministers in the British Government.

Anglo-Portuguese Telephone new ordinary, issued at 25s., are 3s. premium. Johnson & Phillips new ordinary, with £1 paid, are 9s. premium.

Notting Hill—Metropolitan

The Notting Hill Electric Lighting Company has circularised its shareholders with details of the agreement that has been arrived at between the boards of this company and of the Metropolitan Electric Supply Company. Preliminary particulars have been previously published. Eleven Metropolitan shares are offered in exchange for ten ordinary shares of the Notting Hill Company; any fractions that arise are to be settled in cash. The directors state that the terms of exchange have already been accepted by all of themselves, in respect of

their own shares, and by a number of the larger shareholders in the Notting Hill Company. Acceptance has to be notified on or before the first post next Monday, December 23rd.

It may be assumed that the greater part of the Notting Hill shareholders will agree to the exchange of shares. The price of Notting Hill ordinary shares in the market is 55s., and Metropolitans are quoted at 52s. The board points out in its letter that as the total number of issued ordinary shares of the Metropolitan Company is larger than that of the Notting Hill Company, there is a freer market in Metropolitan shares in the Stock Exchange. Alternatively, a holder who does not agree to go into Metropolitan Electrics is offered 55s. per share for his present holding, this price being cum the final dividend for 1935.

Gilt-edged Stocks

The market in British Government and similar securities maintains its strength in a marked manner; the difficulty of obtaining a living rate of income from unimpeachable security is as great as ever. Central Electricity stocks and other gilt-edged issues connected with the electrical industry, hold their full prices. London Passenger Transport "C" has gone back a point, on a little profit-taking, following last week's rise, which took the price to the highest level so far attained since the issue was made.

Ex Dividend

More than a score of debenture stocks of electricity supply companies were quoted, on Monday in this week, ex the half yearly interest due on New Year's Eve or New Year's Day. In the majority of cases, the full amount of the interest was not deducted. Or, putting the same thing another way, part of the interest was immediately recovered. The effect of ex dividend quotation is frequently seen in an increased demand for stock that "looks cheap" when the interest is taken off the price.

Cable and Wireless

Interest in the stocks of the Cable and Wireless group has quietened down. The preference holds its rise at 106, but the "A" and the "B" ordinary stocks are both 10s. lower at 29 and 8¼ respectively. Anglo-American Telegraph preferred continues its upward progress at 123¼, showing a gain of 30s. on the week. The stock now gives a yield of 4¾ per cent. on the money. The deferred, standing at 30, pays 5 per cent. There is not a great deal of difference between the security for the two stocks, although actually the preferred is, of course, the senior of the pair.

United River Plate Telephone, which is controlled by the International Telephone and Telegraph Company declares its usual interim dividend of 2 per cent., less tax, on the ordinary shares. American Telephone and Telegraph, swayed as usual by sympathy with the tendency of the American market as a whole, shows a fall of 5 points at 155 ex dividend. Internationals are 13.

Electricity Supply

Notting Hill preference shares, which will retain their identity in the proposed arrangement between the company and the Metropolitan Electric, are quoted at 14½ ex 6s., less tax, dividend. Price-changes in the list are few and unimportant. London Associated Electric firmed up to 35s. In the overseas group, Victoria Falls ordinary shares at 72s. 6d. are unaffected by declaration of an interim dividend of 4 per cent., the same as that of a year ago. The company's participating preference will receive the 3 per cent. to which they are entitled by way of fixed dividend, and a further 4 per cent. in respect of their participating rights. Perak Electrics have gone further ahead, rising to 21s. 6d.

Manufacturing and Equipment

The general tendency in this market keeps very steady, but it is not surprising to find a few reactions as a sequel to the previous substantial rises. General Electrics, for instance, are 1s. down at 73s., and so are Associated Electrical Industries at 43s. Ericssons at 36s. 3d., British Aluminium at 43s. 9d. and English Electrics at 19s. 6d. show small declines. On the other hand, Enfield Cables are 5s. higher at 5½. Enfield Rolling Mills remain at 22s. 6d. Johnson & Phillips strengthened to 48s. 9d.; Siemens at 27s. 6d. hold their gain of a week ago. Crompton Parkinsons, after their jump to 6½, went back 6s. 3d.; the meeting was followed by a measure of profit-taking. The present price is ex the lordly cash dividend of 39/10d. per share, less tax.

Miscellaneous Matters

Iron and steel shares show variable fluctuations, mostly within narrow margins, because of the long-protracted character of the coal trade negotiations. Babcock & Wilcox keep hard at 52s. Vickers rose to 21s. 6d. before reverting to £1. British Electric Traction deferred stock has put on 45 points. Good rises have lately occurred in shares of local traction companies. In Brazilian Tractions, the recent jump to 10¾ has been succeeded by a relapse to 9½.

The Stock Exchange is closed, of course, on Wednesday and Thursday in next week. In consequence and because the ELECTRICAL REVIEW has to close down for press earlier than usual on account of the holidays, these Stock Exchange pages will not appear again until the first Friday in 1936. It may be hoped that the present prices of each reader's securities, especially of those quoted in our lists, will contribute a tangible token to the expression of good wishes for a Merry Christmas.

Share List of Electrical Companies

	Nom.	Dividend 1933.	Dividend 1934.	Price Dec. 16.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	3¾	—	3 17 5
City of London	1	7½	7½	37/–	—	4 1 0
Clyde Valley	1	7	8	44/–	—	3 12 9
County of London	1	10½	10½	54/–	—	3 17 9
Edmundson's 7% Pref.	1	7	7	36/–xd.	+⅛	3 17 9
Do. Ord.	1	7	8	43/6	+6d.	3 13 7
Elec. Dis. Yorkshire	1	9	9	46/–	—	3 18 3
Elec. Fin. and Securities	1	12½	12½	3⅞	—	3 12 9
Elec. Supply Corporation	1	11	11	3½	—	3 10 3
Lancs Light and Power	1	7½	7½	38/–	—	3 19 0
Lond. Assoc. Electric	1	—	—	35/–	+6d.	4 0 0
London Electric	1	7	8	39/–	—	4 2 0
London Power deb. Red.	Stock	5	5	109½	—	4 11 4
Metropolitan	1	10	10	52/–	—	3 17 0
Midland Counties	1	7	7	38/6	—	3 13 9
Mid. Elec. Power	1	8	8	41/3	—	3 17 6
North Eastern Electric Ordinary	1	6	6	34/–	—	3 10 7
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	51/3	—	3 18 0
Notting Hill 6% Pref.	10	6	6	14½xd.	+½	4 2 9
North Met. Elec. Ordinary	1	10	10	57/6	—	3 9 5
Do. do. 6% Pref.	1	6	6	32/–	—	3 15 0
Scottish Power	1	8	8	42/6	—	3 15 3
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	25/6	—	3 17 8
Yorkshire Elec.	1	8	8	45/–	—	3 11 0
PUBLIC BOARDS.						
Central Electricity 1950–70	Stock	5	5	116	—	4 6 0
Do. 1955–75	„	5	5	119	—	4 4 0
Do. 1951–73	„	4½	4½	111	—	4 1 1
Do. 1963–93	„	—	3½	103½	—	3 7 8
London Elec. Trans. Gtd.	„	—	2½	97	—	2 11 8
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A.	„	—	4½	122½	—	3 13 6
Do. do. B.	„	—	5	128½	—	3 17 10
Do. do. C.	„	3½	4	108	–1	3 14 1
West Midlands Joint Elec. 1948–68	„	—	5	116½	—	4 5 10
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	155xd.	–5	5 16 2
Anglo-Am. Tel. Pref.	Stock	6	6	123½	+1½	4 17 3
Do. Def.	„	1½	1½	30	—	5 0 0
Cable & Wireless 5½% Pref.	„	2¾	4½	106	—	3 17 10
Do. A. 7½% Ord.	„	Nil	Nil	29	–½	—
Do. B. Ord.	„	Nil	Nil	8½	–½	—
Globe Tel. & Tel. Ord.	10	2½	3½*	15½	—	2 5 0
Do. do. Pref.	10	6	6	14½	—	4 4 3
Great Northern Tel.	10	20	20	41	—	4 17 9
Marconi-Marine	1	10	7½	36/3	—	4 2 9
Oriental Telephone Ord.	1	12	12	3½	—	*3 16 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	1450	+45	—
Do. do. Pref. Ord.	„	8	8	173½	—	4 12 3
Brazil Traction	100	—	—	9½	–½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	98½	—	5 1 6
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	3	—	—
Do. 1st Bonds	$500	5	5	50	—	—
Victoria Falls Ord.	1	20	20	3⅝xd.	+⅛	—
West Riding	1	5	6½	47/6	—	2 14 9
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	60/–	—	5 0 0
Assoc. Elec. Ord.	1	4	6	43/–	–1/–	2 15 10
Do. Pref.	1	8	8	39/–	—	4 2 1
Babcock & Wilcox	1	6	8	52/–	—	3 1 6
British Aluminium Ord.	1	5	7½	43/9	–9d.	3 8 6
British Insulated Ord.	1	5	15	5	—	3 0 0
Brush Ord.	Stock	Nil	Nil	51	—	—
Callender's	1	15	15	3¾	—	3 17 5
Do. 6¾% Pref.	1	6¾	6¾	31/3xd.	—	4 3 2
Crompton Parkinson Ord.	5/–	—	12½	5⅜	–½	0 10 6
Do. 8% Pref.	1	8	8	38/9xd.	+⅛	4 2 7
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	3½	32/6	—	2 3 1
Enfield Cable Ord.	1	25	25	5½	+½	4 13 0
English Electric	1	Nil	Nil	19/6	–6d.	—
Do. do. Pref.	1	Nil	Nil	24/–	—	—
Ericsons Tel.	5/–	—	24	36/3	–⅛	—
Ever Ready	5/–	35	35	24/6	–3d.	7 2 10
Ferranti Pref.	1	7	7	27/3	—	5 2 9
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	10	73/–	–1/–	2 14 10
Henley's	1	30	30	7½	—	4 4 3
Do. 4½% Pref.	5	4½	4½	5½	—	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	48/9	+6d.	3 1 6
Siemens Ord.	1	6½	4	27/6	—	2 18 2
Telegraph Construction	£1	Nil	Nil	25/–	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

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5102. "Feeders and the like for electric currents of high frequency." W. S. Percival and E. L. C. White. February 15th, 1934. (Cognate application 22023/34.) (438506.)

5671. "Combined truncheon and electric torch." R. S. Arnell. February 21st, 1934. (438514.)

7959. "Method of and means for the storage or continuous electric heating of water and other liquids." R. Annand. March 13th, 1934. (438593.)

8603. "Frequency changers using electric discharge devices." British Thomson-Houston Co., Ltd. March 18th, 1933. (438719.)

12374. "Moving-coil voltage regulators." Ferranti, Ltd., and E. D. T. Norris. April 24th, 1934. (438791.)

14148. "Rod for making electrical earth connections." British Insulated Cables, Ltd., and L. R. B. Spence. May 10th, 1934. (438598.)

14444. "Coin-operated gas and electricity meters and like mechanisms." United Gas Industries, Ltd., E. W. Smith and A. Charles. May 12th, 1934. (Addition to 404002.) (438520.)

14530. "Means for automatic regulation of the voltage of electric circuits." Naamlooze Vennootschap Stabilovolt. May 13th, 1933. (438521.)

14531. "Means for automatic regulation of the voltage of electric load circuits." Naamlooze Vennootschap Stabilovolt. April 24th, 1934. (438522.)

14844. "Electric feeler control devices." O. Waldrich. May 16th, 1933. (438604.)

14904. "Dry-type electric batteries." R. M. Blomfield and Fuller Accumulator Co. (1926), Ltd. May 17th, 1934. (438663.)

15235. "Electrolytic condensers." Elektrizitäts Akt.-Ges. Hydrawerk. May 26th, 1933. (438608.)

15260. "Radio receiver." Hazeltine Corporation. November 7th, 1933. (438797.)

15278. "Electric discharge devices." General Electric Co., Ltd., H. G. Jenkins and J. W. Ryde. May 22nd, 1934. (438727.)

15286. "Electrical signalling systems." Siemens Bros. & Co., Ltd., P. A. Chittenden, and L. S. Crutch. May 22nd, 1934. (438665.)

15418. "Combined volume control and switch unit." Stackpole Carbon Co., and C. J. Hathorn. May 23rd, 1934. (438799.)

15540. "Manufacture of magnetic dust cores." Standard Telephones & Cables Ltd. May 24th, 1933. (438803.)

15541. "Directional radio transmitting arrangements particularly applicable for determining bearings." C. Lorenz, Akt.-Ges. July 24th, 1933. (Addition to 405727.) (438804.)

15640. "Flexible electric conductors." G. F. Mansbridge, E. Trusler, and Phœnix Telephone & Electric Works, Ltd. May 25th, 1934. (438530.)

15659. "Insulation of high tension conductors in electrical precipitators." L. J. Burrage, R. B. Peacock and Imperial Chemical Industries, Ltd. May 25th, 1934. (438807.)

15694. "Radio transmitting systems." Marconi's Wireless Telegraph Co., Ltd. (R. M. Willmotte). May 25th, 1934. (438809.)

16440. "Cores for high-frequency coils." H. Vogt. June 1st, 1933. (438612.)

17336. "Joining and protecting devices for wireless aerial down-leads." Ward & Goldstone, Ltd., and M. H. Goldstone. June 12th, 1934. (438669.)

17796. "Suspension devices for trolley wires for electrically driven vehicles." Siemens-Schuckertwerke Akt.-Ges. October 30th, 1933. (Cognate application 17797/34.) (438532.)

17994. "Television, telekinematographic and like systems, and apparatus therefore." J. C. Wilson and Baird Television, Ltd. June 18th, 1934. (438533.)

18120. "Means for improving the power factor of alternating currents installations incorporating polyphase motors." English Electric Co., Ltd., L. Roberts, and R. D. Ball. June 18th, 1934. (438534.)

18268. "Thermostatically controlled electromagnetic switch operating devices." C. Bell-Walker, and S. Smith & Sons (Motor Accessories), Ltd. June 30th, 1934. (438617.)

18631. "Electrically operated relay having a combined vibrating member and servo motor." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. June 28th 1933. (438535.)

18649. "Radio receiving apparatus." E. K. Cole, Ltd., F. A. Inskip and A. W. Martin. June 25th, 1934. (438670.)

19739. "Electric cables." Callender's Cable & Construction Co., Ltd., W. C. Smith and L. E. Wood. July 4th, 1934. (438814.)

21691. "Electrostatic devices for the interconversion of electrical vibrations and compressional vibrations in a fluid medium." A. Gemant. July 24th, 1934. (438672.)

21767. "Electric power cable system." Okonite-Callender Cable Co., Inc. September 2nd, 1933. (438673.)

25030. "Receiver of electrical currents for the remote-control of apparatus." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. September 14th, 1933. (438542.)

26214. "Electric heating and cooking devices." British Thomson-Houston Co., Ltd. September 12th, 1933. (438547.)

27058. "Tuning indicators for wireless apparatus." General Electric Co., Ltd., and W. H. Peters. September 20th, 1934. (438628.)

28604. "Loudspeakers." W. J. Tennant (Rola Co.). October 5th, 1934. (438824.)

30239. "Electrical musical instruments." General Electric Co., Ltd., and G. T. Winch. October 22nd, 1934. (438681.)

31860. "Thermionic electrodes." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). November 6th, 1934. (438683.)

34473. "Radio receivers." J. Dreyfus. April 16th, 1934. (Cognate application 34474/34.) (438631.)

34858. "Electromagnet speed-responsive devices." British Thomson-Houston Co., Ltd. December 6th, 1933. (438632.)

35816. "Electric incandescent lamps for vehicle illumination." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 22nd, 1933. (438830.)

36894/5. "Radio receiver." Hazeltine Corporation. November 7th, 1933. (Divided out of 438797.) (438831/2.)

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2633. "Hydraulic operating mechanism particularly for circuit-breakers." British Thomson-Houston Co., Ltd. January 27th, 1934. (438559.)

4659. "Control system or arrangements for providing a control in response to changes of voltage or current ratio." C. E. P. Jones. July 25th, 1934. (Divided out of 20967/33.) (438839.)

5895. "Trunk communication electric cables." Siemens & Halske Akt.-Ges. April 18th, 1934. (438560.)

7296. "Apparatus for recording electric signals." Standard Telephones & Cables, Ltd. (Matériel Téléphonique Soc., Anon.). March 8th, 1935. (438768.)

9359. "Coils for electric ignition apparatus." R. Bosch Akt.-Ges. July 21st, 1933. (Divided out of 16537/34.) (438772.)

9852. "Thermionic valve circuits." Standard Telephones & Cables, Ltd. May 26th, 1934. (438565.)

9973. "Plug-and-socket couplings provided with switches." Electrolux, Ltd. April 3rd, 1934. (438692.)

10620. "Electric switches or circuit-breakers." British Thomson-Houston Co., Ltd. April 5th, 1934. (438693.)

11443. "Radio receiving systems." C. Lorenz Akt.-Ges. April 18th, 1934. (Cognate applications 11444/35 and 11445/35.) (438568.)

12172. "Electrically heated cooking utensils." H. Wilcox. April 23rd, 1935. (438570.)

12446. "Method of and means for radio-goniometric position finding." A. Bertrand and M. Parisier. April 25th, 1935. (438852.)

12622. "Crossings for electric vehicle transmission systems." E. M. Skerritt and T. M. Watson. April 27th, 1935. (438571.)

13162. "Mounting blocks for electrical fittings or accessories." R. Bain and N. Allday. May 3rd, 1935. (438695.)

13785. "Electric welding composition." Union Carbide & Carbon Research Laboratories, Inc. February 21st, 1933. (Divided out of 5619—20/34.) (Cognate application 13786/35.) (438855.)

14645. "Cover plates for electric switches." R. Bain and N. Allday. May 20th, 1935. (438576.)

14789. "Telephone systems." A. Szilard and G. Keleti. May 23rd, 1934. (438696.)

14937. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 4th, 1934. (438698.)

15074. "Electric power switches." Siemens-Schuckertwerke Akt.-Ges. May 24th, 1934. (438577.)

15227. "Resilient mountings for dynamo-electric machines and the like." British Thomson-Houston Co., Ltd. May 25th, 1934. (438578.)

17541. "Electric power-transmitting apparatus, especially for sewing machines." G. M. Pfaff Akt.-Ges. June 18th, 1934. (438581.)

17623. "Battery terminal clips." G. Stains, Ltd., and G. C. Stains. June 19th, 1935. (Addition to 420385.) (438704.)

18334. "Resistance materials." British Thomson-Houston Co., Ltd. June 27th, 1934. (438706.)

18947. "Electrical high-frequency feeder arrangements." Marconi's Wireless Telegraph Co., Ltd. (Telefunken Ges. für Drahtlose Telegraphie). July 2nd, 1935. (438649.)

20168. "Coils for electric ignition apparatus." R. Bosch Akt.-Ges. July 14th, 1934. (438783.)

20598. "Electric discharge devices." British Thomson-Houston Co., Ltd. July 21st, 1934. (438653.)

20599. "Systems for automatic control of a condition produced by an electric current." British Thomson-Houston Co., Ltd. July 20th, 1934. (438712.)

27808. "Television, picture telegraphy, and the like." L. Schiff. April 9th, 1934. (Divided out of 10683/34.) (438716.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 11th:—

Emcol. No. 564177. Class 5. Dynamo-electric machines.—Laurence, Scott & Electromotors, Ltd., Gothic Works, Norwich.

Graham Farish Ring (lettering and design). No. 562154. Class 8. Thermionic valves.—Graham Farish, Ltd., 153, Masons Hill, Bromley, Kent.

Vi-Tan. No. 562279. Class 6, also Vi-Tan Ultra Violet Ray Home Units (lettering and design). No. 562281. Class 8. Mercury vapour lamps for scientific purposes.—Thermal Syndicate, Ltd., Neptune Bank, Wallsend-on-Tyne.

Mistic. No. 563521. Class 8. Cash trays incorporating signs fitted with electrical illuminating means which are operated by the weight of cash placed on such trays.—M. Newmark & Co., 77, Milton Street, E.C.2.

Radior (lettering and design). No. 563198. Class 13. Electric lamps (ordinary).—Splendor Gloeilampenfabriek Vennootschap, Nijmegen, Holland. (British representatives: Sefton-Jones, O'Dell & Stephens, 285, High Holborn, W.C.1.)

Ennwell. No. 564146. All goods in Class 13.—Allbright Electrical Co., Ltd., 2-5, Dingley Place, City Road, E.C.1.

The E.A.W. in North Wales

A North Wales Coast Branch of the Electrical Association for Women has just been formed. Mrs. Hyde is president, Mrs. Watts-Jones vice-president, and Mrs. Preston (Deganwy) chairman.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alfreton.—Houses, Oakland Street and Langley Avenue, Somercotes; R. E. Ward, surveyor.

Atherstone (WARWICKSHIRE).—Houses (80), Atherstone and Ploesworth (£23,400), with electrical work; Eadie & Co., Ltd., builders, Wolverhampton.

Bacup.—Houses (110); H. Guffogg, borough surveyor, Municipal Offices.

Barnsley.—Houses (77), Mount Vernon estate; Harold Taylor, borough engineer.

Barrow-in-Furness.—Houses (54), Highfield Road; W. Hull. Cinema, Abbey Road; James Brennan.

Birmingham.—Houses, Stirchley and Chester Road (£62,000); city engineer. Fire station, Bushy Wood Road, Selly Oak; Watch Committee.

Bradford.—Houses (288), Canterbury estate; city architect.

Brighton.—Development of Withdean estate (27 acres); Varndean Estates, Ltd. Houses, Chichester estate and Nelson Row, and extensions to Mental Institution (£30,000); borough engineer.

Bromsgrove.—Houses (25), Upton Warren, near Bromsgrove; S. I. King, surveyor, 29, Waterloo Street, Birmingham.

Cambridgeshire.—Village college, Bottisham; county architect.

Canterbury.—Schools (650 places), Wincheap; director of education.

Carlisle.—Houses (76), Knowe Park estate; J. Laing & Son, Ltd. Houses (28), Lansdowne Crescent; E. C. Coleman.

Chanctonbury (SUSSEX).—Houses (164); W. H. Green & Sons, builders.

Chertsey.—Houses (20); U.D.C. surveyor.

Cheshunt.—Houses (104), Lodge estate, High Street, Waltham Cross, for H. C. Leach.

Chesterfield.—Sweet factory, Stone Gravels, for F. Windle, Holme Road; J. Colliss & Sons, Ltd., builders, 21, Saltergate.

Chichester.—R.C. church and hall (£22,000); Rev. Father Measures.

Chilton (Co. DURHAM).—Cinema; E. Stephenson, Ferryhill, Co. Durham.

Coseley.—Houses (60), Birmingham Road; Marshall & Son, builders, The Uplands, Mosley Road, Willenhall, Staffordshire. Houses (50), Kenelm Road; B. H. Bate, Lydiate House, Bellbroughton, near Dudley. Houses (40), Ladymoor Road; J. Walton, surveyor, 28, Darlington Street, Wolverhampton.

Darlaston.—Cinema (1,500 seats); D. & D. Cinemas, Ltd.

Dartford.—Houses (102), Heath Farm estate; A. V. G. East. Houses (104), St. Vincent's estate; M. J. Orr.

Denbighshire.—Central school, Abergele, for County E.C.; G. D. Wiles, county architect, Acton Hall, Wrexham.

Devonshire.—Senior schools, Braunton, Great Torrington and Salcombe, for County E.C.

Durham.—Houses (39), Coxhoe; J. N. Adams, architect, Bywell Lodge, Hawthorne Terrace.

Edinburgh.—Factory, 32, Halmyre Street, Leith, for Geo. Reed & Co., Ltd.

Glasgow.—Houses (1,342), for Corporation; architect, Housing Dept. Additional accommodation for the Gartloch Mental Hospital (£180,000), also nurses' home (£24,000); city architect.

Golborne.—Houses (49); U.D.C. surveyor.

Halesowen.—Houses (120), Red Leasowes estate; U.D.C. surveyor. Houses (24), Park Lane site; W. J. Tolley, builder.

Hamilton.—Hall and municipal buildings; burgh surveyor.

Hampshire.—Senior schools, Chandler's Ford; director of education, Winchester.

Haslingden.—Houses (38) and flats, Longshoot; borough surveyor.

Hatfield (HERTFORDSHIRE).—Church, Birchwood housing estate, for the Methodist trustees; secretary.

Hyde.—Extensions to works, Mottram Road; T. Wall & Sons, Ltd.

Irish Free State (ENNIS, Co. CLARE).—Schools, for the Christian Bros.; Edward F. Ryan, architect, 88, O'Connell Street, Limerick. (SWINFORD, Co. MAYO).—Electrical installation to fever hospital, Swinford, for the Mayo Board of Health, Castlebar; P. J. Munden, architect, 1, South Frederick Street, Dublin.

Kidderminster.—Houses (75), Foley Park estate; borough engineer. Additions to Futurist Cinema, Vicar Street; B. Priest. Extensions to Stourvale works; Baldwins, Ltd.

Lanark.—Cinema, Bannatyne Street (electrical work), for Regal Pictures (Lanark), Ltd. (£15,000); Lennox D. Paterson, architect, Hamilton.

Lewes.—Houses (28); Butler Bros., builders, Birmingham.

Llanelly.—Houses (72), Penyfan, with electrical work; borough surveyor, Town Hall.

London.—(BETHNAL GREEN).—Houses, Pedley Street (£35,000); L.C.C. architect. (CAMBERWELL).—Tenements, Friary estate (£22,400); E. D. Winn & Co., Ltd., 36, Wilton Place, S.W.1. School, Lyndhurst Grove, Peckham, for London, E.C. (LAMBETH).—Slum clearance (£37,000); L.C.C. architect. (LEWISHAM).—Houses (93 acres), Whitefoot Lane (£250,000); L.C.C. architect. (SHOREDITCH).—Tenements, Haggerston Road (£142,300); L.C.C. architect. (WANDSWORTH).—Reconstruction of bridge over Thames (£492,500); L.C.C. Highways Committee. (WESTMINSTER).—Buildings, 2-4, Dean Street; Considere Constructions, Ltd., 72, Victoria Street, S.W.1.

Luton.—Houses (110), Hart Lane estate, for H. C. Janes, Ltd. Houses (62), near Stockingstone Road, for Davis Estates, Ltd., Kilburn, London, N.W.6. Houses (30), St. Paul's Road, for J. Frost. Houses (29), for C. Wells. Houses (26), Connaught Road, for W. Gutteridge. Extensions to factory, including generator house, Oakley Road, for Electrolux, Ltd.

Manchester.—Houses (30), Answell Avenue, Bryn Orme Road, Crumpsall; W. J. Davies, builder, 7, Royston Avenue, Whalley Range. Houses (51), Brentford Drive, Ford Bank Road and Wanford Gardens, Didsbury; The Ford Bank Estate, Ltd., builders, 27, King Street West. Houses (30), Fig Lane, Didsbury; W. R. Parkinson, builder, Clock House estate, Greenside Lane, Droylsden. Houses (46), Rosine Street, Rayleigh Avenue, Erdington Avenue, and Newhaven Avenue, Openshaw; Fairholm Estates, Ltd., 40, South King Street. Cinema, East Lancashire Road and Henniker Street, Swinton, for the Snape-Ward Cinema Circuit, 13, St. Ann's Street; Foden Hemm & Williams, architects, 199, Deansgate.

Market Harborough.—Shop and offices, St. Mary's Road; K. F. Kirby, Ltd.

Newcastle (STAFFORDSHIRE).—Houses (32), Alsagers Bank; A. P. Lovatt, architect, 2, King Street. Houses (24); A. E. Howe, Silverdale Road, Knutton. Houses (66), Whitehouse estate, with electrical work; F. Gibson, Whitehouse estate, Cross Heath.

North Riding.—Additions to Richmond Grammar School for County E.C.; J. R. White, county architect, County Hall, Northallerton.

Nottingham.—Slaughter house, Cattle Market Road and Meadow Lane (£28,808); City Markets Committee.

Oban.—Extension to Park Hotel; A. McGregor Mitchell, 131, West Regent Street, Glasgow.

Oldham.—Houses (76), Carrcote and Dark Lane site, Delph; Gordon Kenworthy, architect, 52, Union Street.

Portsmouth.—Cinema, Fratton Road; Robert Crombie, architect.

Reading.—Cinema, Cheapside, for Odeon Theatres, Ltd.

Reigate.—Houses (30), Hitchings Way, for Sandcross Estates, Ltd.

Rhyl.—Cinema, for Rhyl Entertainments, Ltd.; S. C. Foulkes, architect.

Rochdale.—Extensions to Isolation Hospital, Littleborough, for the Littleborough Milnrow and Wardle Joint Hospital Committee; A. Travis, architect, Market Chambers, Rochdale.

Rochester.—Houses (123), for Rochester Garden City Estates, Ltd.

Rothesay.—Indoor swimming baths (£20,000); burgh surveyor.

Rotherham.—School, East Dene (250 places), for the R.C. managers; Rev. Father W. O'Shaughnessy, St. Bede's Church.

Royston (NEAR BARNSLEY).—Houses (36), Cross Lane; Dyson, Cawthorne & Coles, architects, 25, Regent Street, Barnsley.

Rugby.—Houses (174), Westfield estate, Bilton Road, for Davis Estates, Ltd., Kilburn, London, N.W.6.

St. Helens (LANCASHIRE).—Houses (200); borough surveyor.

Saddleworth (LANCASHIRE).—Houses (76), Delph; Gordon Kenworthy, architect.

Salford.—Flats (312), Seedley Road, Pendleton, for Sutton Dwelling Trust, Victoria House, Southampton Row, London, W.C.1; Kettlewell, Sons & Co., builders, 11, Colonial Street, Hull.

Seven Kings.—Sports stadium, adjoining railway station (£125,000); J. S. Hoskins, managing director, West Ham Speedways.

Sheffield.—Elementary school, Shirecliffe estate; W. George Davies, architect, Town Hall.

Shrewsbury.—Houses (119), near Shrewsbury-Whitchurch Road, Halescott; Fletcher Estates (Halescott), Ltd.

Sittingbourne.—Business stores, Bell Road, for Sams, Ltd.

Solihull.—Cinema (1,500 seats); D. & D. Cinemas, Ltd.

Southam.—Houses (24), Harbury; George Hunt, builder.

Southend-on-Sea.—Offices, for the electricity department; A. C. Johnson, borough electrical engineer, 85, London Road.

South Shields.—Houses (468), Prince Edward Road estate (£131,769); Kettlewell, Son & Co., Ltd., Hull.

Spennymoor (Co. DURHAM).—Houses (106); U.D.C. surveyor.

Stockport.—Secondary school (£45,589); E. Taylor & Co., Ltd., builders, Littleborough.

Stockton-on-Tees.—Houses (66), Durham Road; G. Fordy & Sons, builder, Durham Road.

Strood (KENT).—Houses (36), Halling; W. J. Stimpson, R.D.C. surveyor.

Sunderland.—Extensions to Fenwick & Sons' premises; G. E. Matkin, architect, Barclays Bank Chambers, Fawcett Street.

Surrey.—Police buildings, various districts (£50,000); county architect, Kingston-on-Thames.

Swindon.—Houses (58), Northern Road; A. J. Colbourne. Houses (69), near Vicarage Road; E. W. Beard, Ltd. Cinema and shops, Regent Street; W. R. Glen. Reconstruction, 32-4, Bridge Street; W. J. Dacombe & Son.

Teddington.—Houses (20); E. Bostock, U.D.C. surveyor.

Waddon (SURREY).—Factory, near Purley Way; Union Radio Co., Ltd., 15a, Campbell Road, W. Croydon.

Wakefield.—Houses (150), various estates; city architect.

Warrington.—Houses (30), Sankey Lodge estate; D. Cooper, builder, Clarence Street.

Wath-on-Dearne.—Houses (50), near Oaklea Avenue; H. Cranage, surveyor, Town Hall.

West Riding.—School (400 places), Kirk Sandall; county education officer.

West Sussex.—School, Selsey, and extensions to Chichester High School for Girls (£24,000), for County E.C.; county architect, Chichester.

Whitby.—Isolation hospital; H. Davis, architect, Abbey House, Victoria Street, London, S.W.1.

Wigan.—Houses (36), Lessingham Avenue, near Queensway, for G. Hall. Houses (25), Inglewhite Avenue, for G. E. Hall.

Worcester.—Civic centre, with electrical work; Ivor Jones & Thomas, architects, Cardiff.

Wrexham.—Houses (36); G. F. Sumner, builder.